SCIENCE

THE MAIN BOOK

FIRST TERM

BY A GROUP OF SUPERVISORS

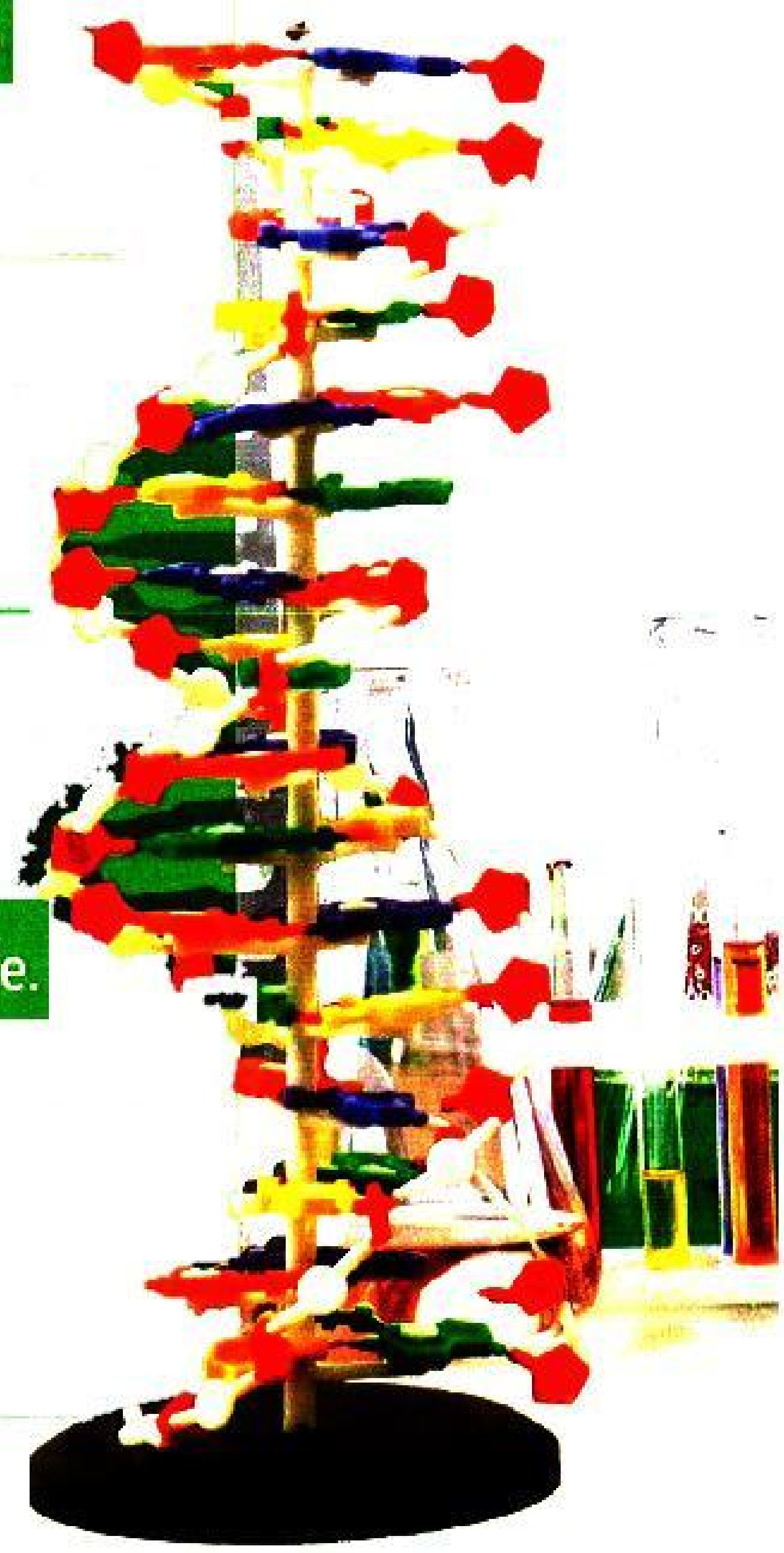


Contents

UNIT 1

Periodicity of Elements and their Properties

Lesson 1	Attempts of Elements Classification.
Lesson 2	Graduation of Elements Properties in the Modern Periodic Table.
Lesson 3	Main Groups in the Modern Periodic Table.
Lesson 4	Water.



Unit Objectives :

By the end of this unit, students will be able to :

- Follow the efforts and attempts of some scientists to classify elements (Mendeleev - Moseley - Modern Periodic Table).
- Recognize the principles of elements classification in the modern periodic table.
- Estimate scientists' efforts in discovering, classifying and investing elements.
- Determine the location and properties of some elements in the modern periodic table by recognizing their atomic numbers.
- Compare between the properties of groups and periods in the modern periodic table.
- Compare between metals, nonmetals and inert gases from their electronic configuration and chemical activity.
- Describe main groups in the modern periodic table.
- Describe elements properties and their uses.
- Use tools, materials and instruments in studying elements properties.



- Determine the chemical and natural properties of water.
- Explain the irregularity of the natural properties of water.
- Describe the chemical bonds among the atoms and molecules of water (covalent and hydrogen).
- Recognize the polarization of some chemical compounds (Water - Ammonia).
- Recognize the electrolysis of water.
- Explain the equivalence of water.
- Describe how water reacts with some of the elements of chemical activity series.
- Determine water pollutants and their bad effects.
- Determine the methods and measures of protecting water from pollution.
- Determine his/her personal responsibilities to protect water from pollution.
- Take needed decisions to protect water from pollution.

Lesson 1

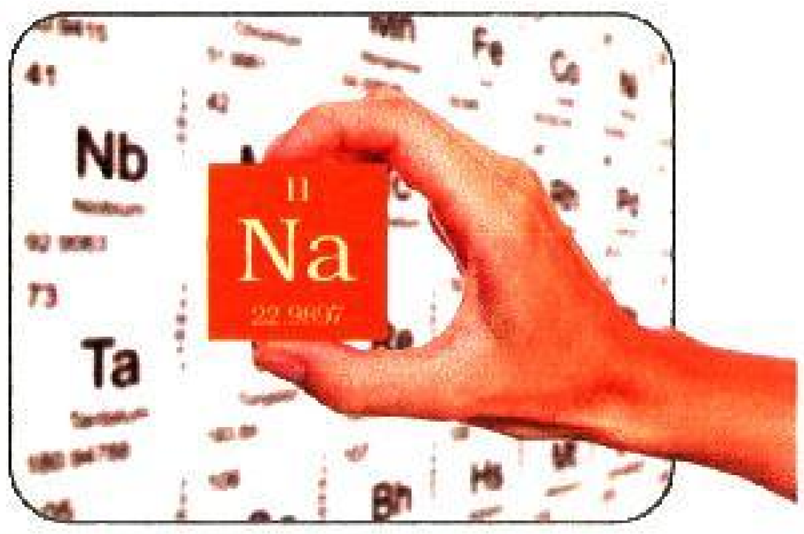
Attempts of Elements Classification



What are the most important attempts to classify elements ?

Many attempts are made by scientists for classification of elements according to their properties **G.R.** In order to :

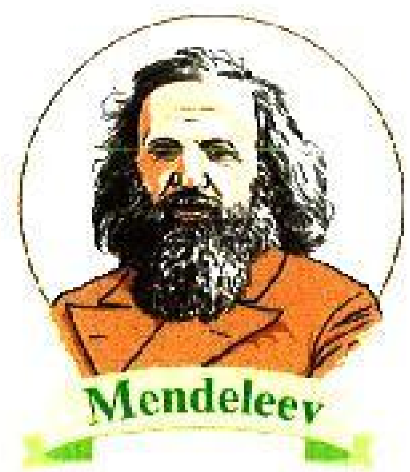
- Facilitate their study.
- Find a relationship between elements and their chemical and physical properties.



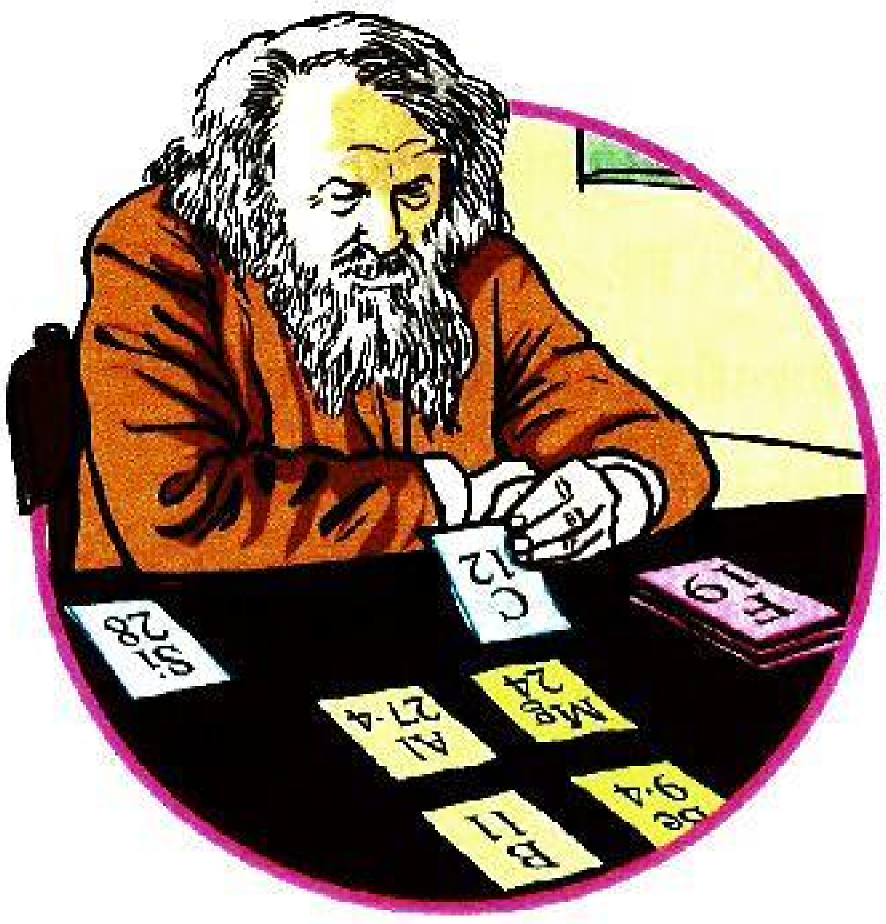
The most important attempts are

1. **Mendeleev's** periodic table.
2. **Moseley's** periodic table.
3. **Modern** periodic table.

1 Mendeleev's periodic table



- It is the first real periodic table for classifying elements.
- At this time, only **67 elements** were known.
- The Russian scientist **Mendeleev** explained his periodic table in his book **"Principles of Chemistry"** in 1871



How did Mendeleev classify elements ?

1 He prepared **67 cards**, each card represented an element.

2 **He recorded on each card :**

- The symbol of one element.
- Atomic weight of this element.
- Important properties of this element (boiling point, melting point, density, formula of oxide, ...).

3 He arranged elements of similar properties in **vertical columns** which were known later as **groups**.

4 **He classified the elements of each main group into two subgroups (A) , (B) G.R.**
Due to the differences between their properties.

5 **He discovered that :**

- The elements are arranged in an ascending order according to their atomic weights on moving from the left side of the table to the right side in **horizontal rows** which were known later as **periods**.
- The properties of elements were **repeated periodically** by the beginning of each **new period**.

Advantages of Mendeleev's table

1. He predicted the discovery of new elements and determined the values of their atomic weights, therefore he left gaps (empty cells) in his table.
2. He corrected the atomic weights of some elements, which were estimated wrongly.

▸ Enrichment information

In 1871, Mendeleev predicted the properties of an unknown element and named it (ICA silicon) . This element was discovered later in 1886 and was named Germanium (Ge) and its properties were the same as Mendeleev had predicted.

Disadvantages of Mendeleev's table

1. **He had to make a disturbance in the ascending order of atomic weights of some elements G.R.** To put them in groups that suit their properties.
2. **He would have to deal with the isotopes of one element which were discovered later as different elements G.R.** Due to the difference in their atomic weights.

G.R. ***Mendeleev had to put more than one element in one cell as iron, cobalt and nickel.***
Due to the similarity in their properties.

Enrichment information

- *Isotopes : Many forms of atoms of one element having the same atomic number but differ in atomic weight such as: the isotopes of hydrogen* ^1_1H , ^2_1H , ^3_1H

2 Moseley's periodic table

In 1913 :

- The Newzealand scientist **Rutherford** discovered that the nucleus of the atom contains positively charged protons.



Rutherford

- In the same year, the British scientist **Moseley** :
  - Named the term of "atomic number" of an element on the number of positive protons in the nucleus of its atom.
  - Discovered after studying X-rays properties, that the periodicity of elements properties is related to their atomic numbers and not to their atomic weights as Mendeleev believed.



Moseley

Enrichment information

Among the discoveries which have helped Moseley to put his periodic table are :

1. Radiation activity phenomena. *2. Getting of X-rays.*

3. More knowledge about the arrangement of electrons in atoms.

The most important modifications of Moseley on Mendeleev's table

1. He arranged elements in an **ascending** order according to their **atomic numbers**, where the atomic number of each element increases by **one** from the preceding element in the same period.

2. He added to the table :

- The **zero group** which includes inert (noble) gases.
- The **other elements** that were discovered after the preparation of Mendeleev for his periodic table.

3. He specified a place below the table for lanthanides and actinides elements.

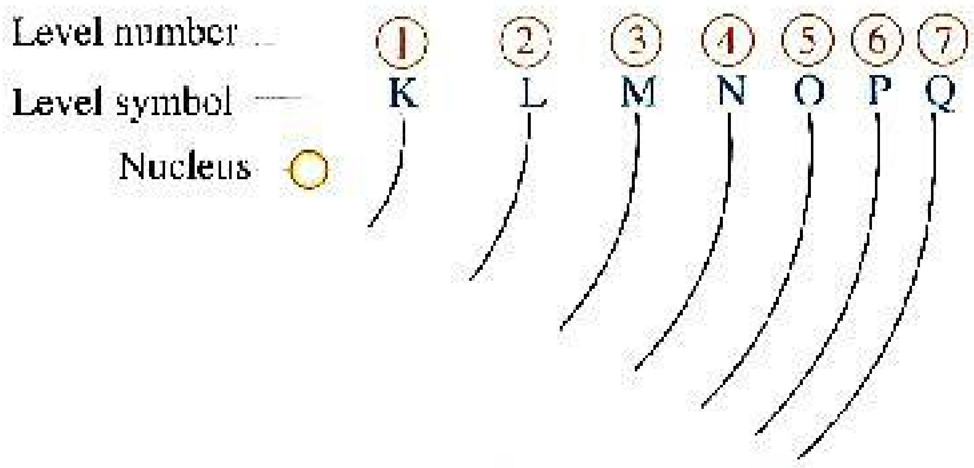
3 Modern periodic table

- **The recent studies led to the identification of the accurate composition of the atom, where :**
  - The Danish scientist **Bohr** discovered the **main energy levels** of the atom (as shown in the following figure) and their number reaches 7 in the heaviest known atoms till now.



Bohr

  - **Scientists** discovered that each main energy level consists of a definite number of other levels known as ***energy sublevels***.



Main energy levels

- **Accordingly**
  - The elements were reclassified in a new table known as the ***"Modern periodic table"*** in which the elements are classified in an **ascending** order according to :
    - Their atomic numbers.
    - The way of filling their energy sublevels with electrons.

Enrichment information

Each main energy level consists of *a number of energy sublevels equals to its number.*

Main level	First K	Second L	Third M	Fourth N
Sublevels	s	s, p	s,p,d	s,p,d,f

Note

The number of known elements in the modern periodic table till now is 118 elements, Where 92 elements are abundant (available) in Earth's crust, while the rest are prepared artificially under special conditions.

Enrichment information

The recently discovered elements do not exist in nature, but they are prepared artificially from other elements. They are radioactive elements, whose nuclei disintegrate in less than a second.

*** We can summarize the scientific principle of elements classification in the following diagram :**

The scientific principle of elements classification in


Mendeleev's periodic table


Moseley's periodic table

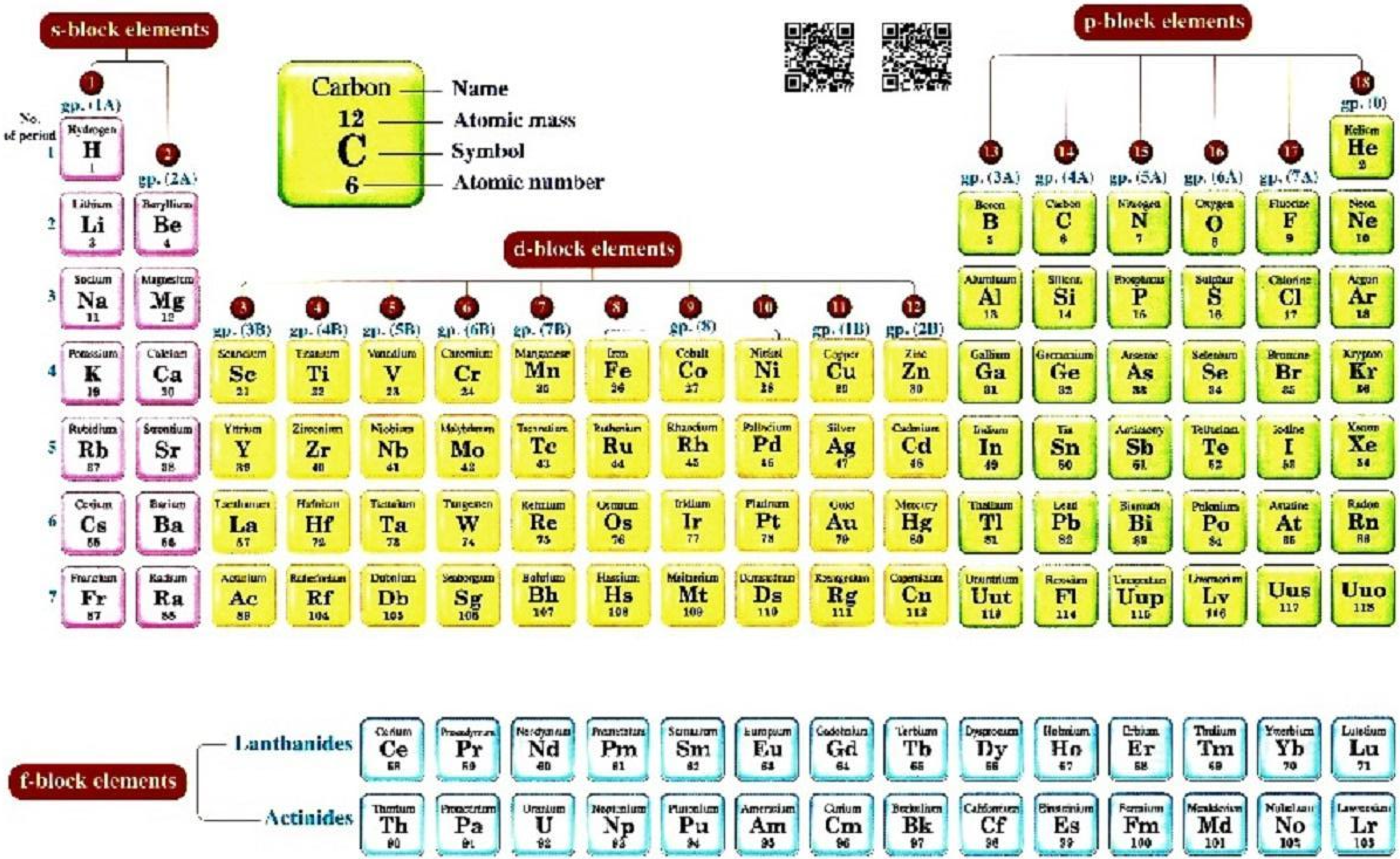

Modern periodic table

Elements are classified in an ascending order according to :

- Mendeleev's periodic table: Their atomic weights.
- Moseley's periodic table: Their atomic numbers.
- Modern periodic table:
  - Their atomic numbers.
  - The way of filling their energy sublevels with electrons.

TRY to answer worksheet 1 in the Notebook

Blocks of Modern Periodic Table



Description of the modern periodic table

*** The modern periodic table (shown in the previous page) consists of :**

- 7 horizontal periods, where each period starts by filling a new energy level.
- 18 vertical groups, where each group has a traditional number and a modern number.

*** The modern periodic table is classified into 4 main blocks :**

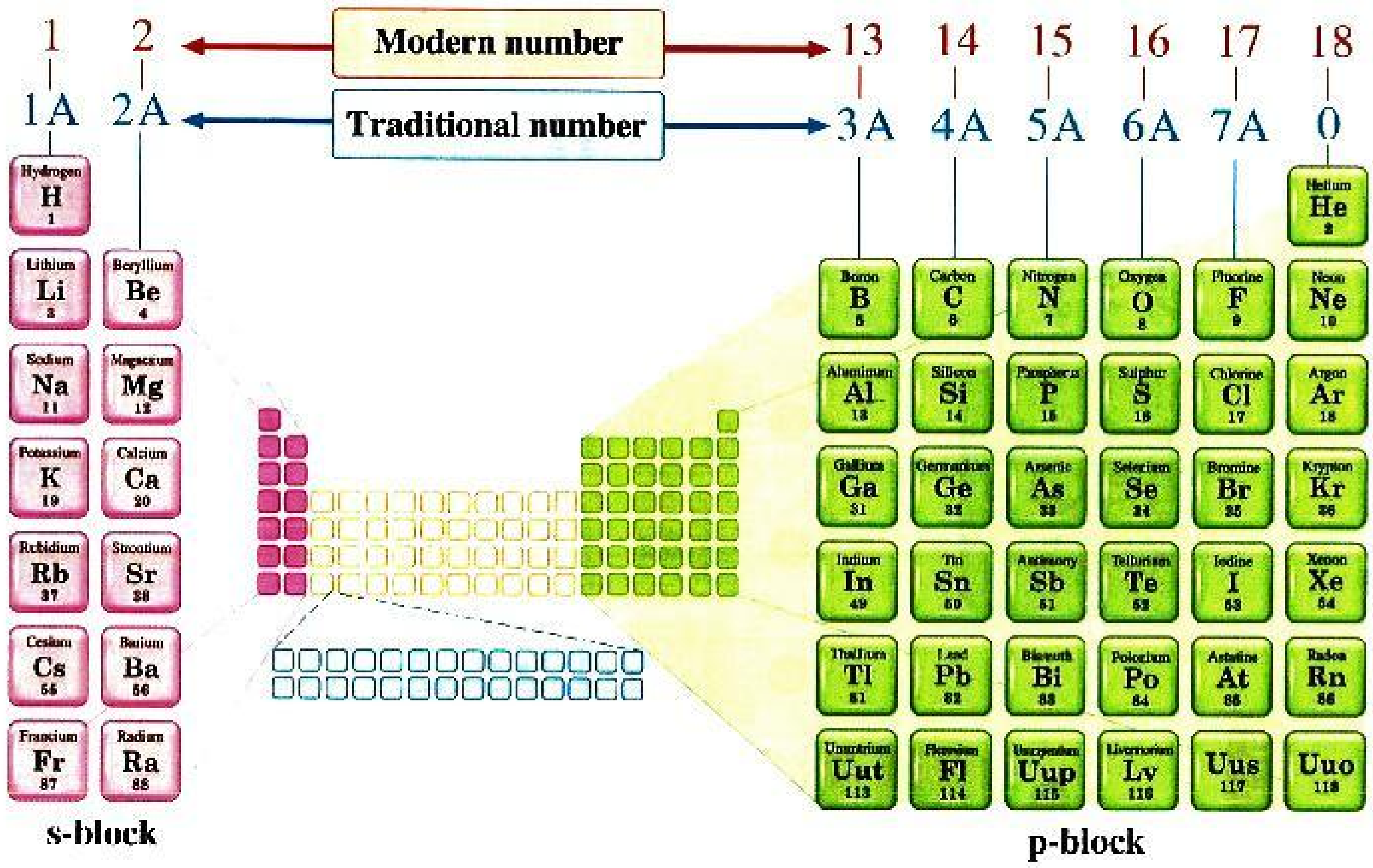
1 s-block , 2 p-block , 3 d-block , 4 f-block ,

1 s-block

- It is located on the **left side** of the periodic table.
- It consists of **two** groups.
- The two groups of s-block take letter "A".
- It includes the two groups (**1A**) and (**2A**).

2 p-block

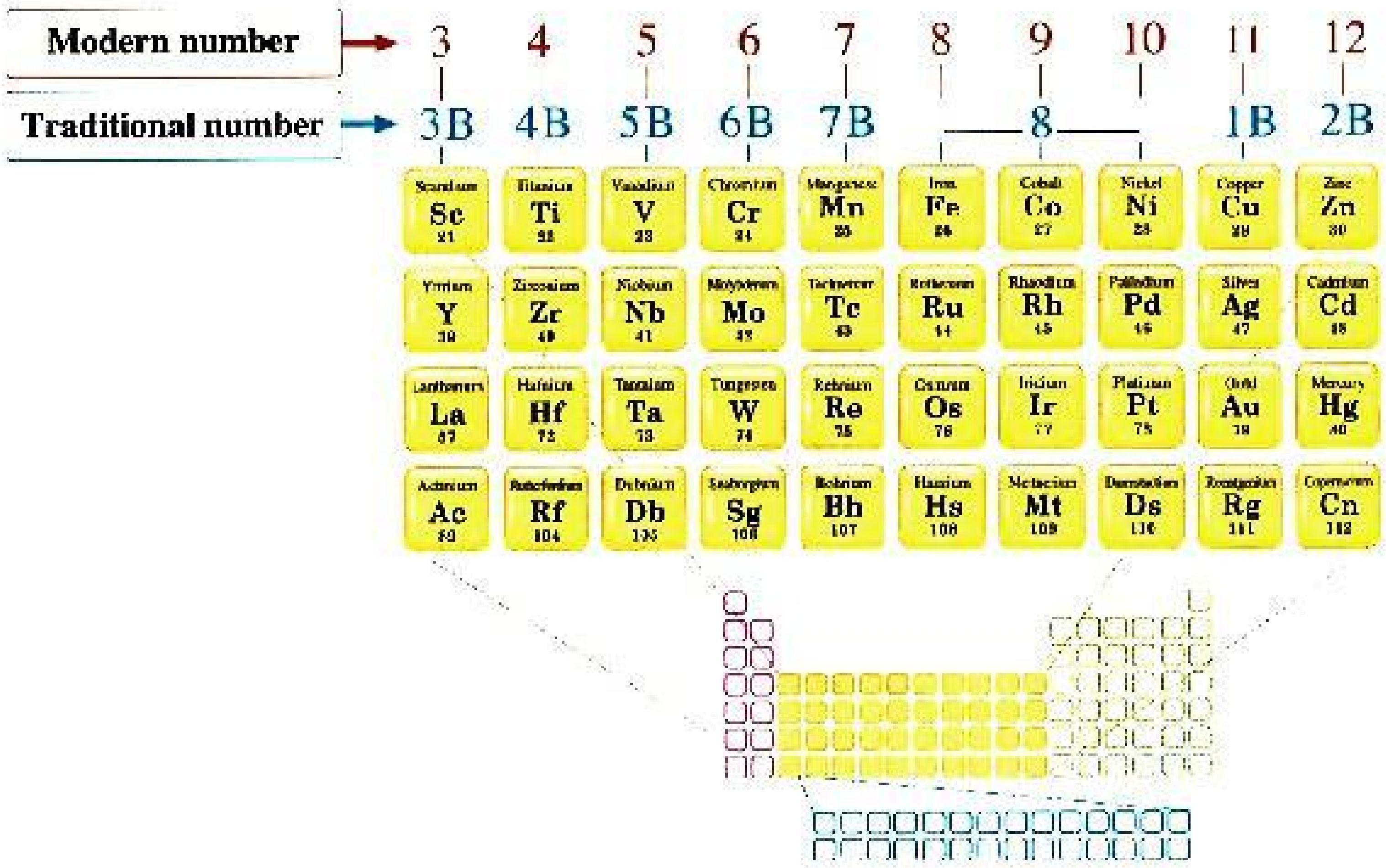
- It is located on the **right side** of the periodic table.
- It consists of **six** groups.
- All groups of p-block take letter "A" except zero group (18) "Noble gases".
- It starts with group **3A** (**13**) and ends with zero group (**18**).



The position of s-block and p-block groups in the modern periodic table

3 d-block

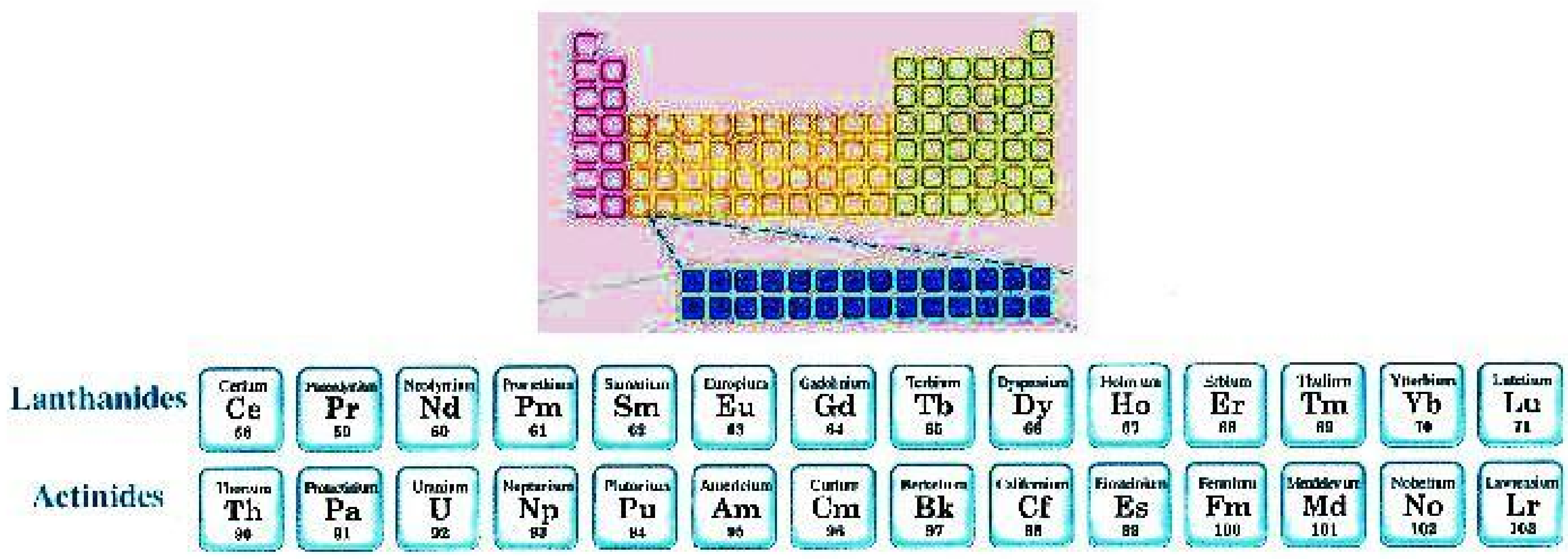
- It is located in the **middle** of the periodic table.
- It separates between **s-block** elements (left side of the table) and **p-block** elements (right side of the table).
- It consists of **ten** groups.
- All groups of d-block take letter "**B**" except group (**8**) which contains 3 vertical columns.
- It starts to appear from **period (4)**.
- It starts with group **3B** (**3**) and ends with group **2B** (**12**).
- The elements of d-block are known as **transition elements**.



The position of d-block groups in the modern periodic table

4 f-block

- It is located **below** the periodic table.
- It consists of two horizontal series which are **lanthanides** and **actinides**.



The position of two series of f-block in the modern periodic table

Remember

*** You have known from the previous studies that :**

- The atomic number = Number of electrons = Number of protons.
- The number of electrons which saturate the first four energy levels (K, L, M and N) can be calculated from the relation ($2n^2$), where (n) is the number of energy level therefore :

(1) K level is saturated with 2 electrons. (2) L level is saturated with 8 electrons.

(3) M level is saturated with 18 electrons. (4) N level is saturated with 32 electrons.

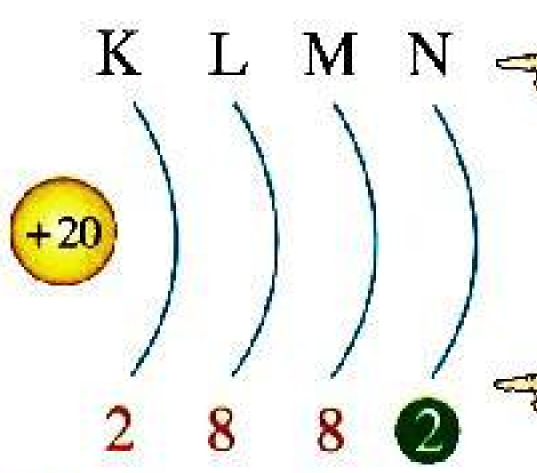
How to determine the location of elements of groups (A) in the periodic table by knowing their atomic numbers :

Write The electronic configuration of the atom of the element.

And from this determine

1. The number of energy levels occupied by electrons **indicates** The period number of the element.
2. The number of electrons in the outermost energy level **indicates** The group number of the element (according to the traditional number).

Application : Determine the location of $_{20}Ca$ in the modern periodic table.



Electronic configuration of $_{20}Ca$ atom

- Number of energy levels occupied with electrons = **4 energy levels** → So → The element is located in **period (4)**.
- Number of electrons in outermost energy level = **2 electrons.** → So → The element is located in **group (2A)**.

Note

The outermost energy level of all noble gases is completely filled with 8 electrons except helium with 2 electrons, because it contains only one energy level (K level).

✳ The following table shows examples on determination of the location of some elements of groups (A) in the modern periodic table :

Element	Electronic configuration	Number of energy levels occupied by electrons	Period number	Number of electrons in the outermost energy level	Group number		Block
					Traditional	Modern	
$_8O$	(+8) K L: 2 6	2	2	6	6A	16	p-block
$_{10}Ne$	(+10) K L: 2 8	2	2	8	zero	18	p-block
$_{12}Mg$	(+12) K L M: 2 8 2	3	3	2	2A	2	s-block
$_2He$	(+2) K: 2	1	1	2	zero	18	p-block

G.R. ***Helium ($_2He$) is located in zero group, and isn't located in group (2A).***
Because it has only one energy level (K) which is saturated with 2 electrons, so it is a noble gas that is located in zero group (group 18).

Question

Complete the following table :

Element	Electronic configuration	Number of energy levels occupied by electrons	Period number	Number of electrons in the outermost energy level	Group number		Block
					Traditional	Modern	
$_{15}P$	(+15) K L M:						....
$_{18}Ar$	(+18) K L M:						....
$_{19}K$	(+19) K L M N:				1A	1	....
$_1H$	(+1) K: ...		1				....

※ From the previous explanation, we conclude that :

Elements of the same group	Elements of the same period
Number of energy levels	
• They are different in the number of energy levels occupied by electrons.	• They are similar in the number of energy levels occupied by electrons.
Chemical properties	
• **They are similar in their chemical properties.** G.R. Because they are similar in the number of electrons in the outermost energy level.	• **They are different in their chemical properties.** G.R. Because they are different in the number of electrons in the outermost energy level.
G.R. ***Magnesium ($_{12}Mg$) and calcium ($_{20}Ca$) are similar in their properties.*** Because they are located in the same group (2A), so they are similar in the number of electrons in the outermost energy level (2 electrons).	G.R. ***Aluminium ($_{13}Al$) and chlorine ($_{17}Cl$) are located in the same period in the periodic table.*** Because they are similar in the number of energy levels occupied by electrons (3 energy levels).

How to determine the atomic number of elements of groups (A) by knowing their location in the periodic table :

Determine

1. The number of energy levels occupied by electrons → **by knowing** → The period number of the element.
2. The number of electrons in the outermost energy level → **by knowing** → The group number of the element (according to the traditional number).

Write The electronic configuration of the atom of the element taking into consideration that the inner energy levels are completed with electrons.

Calculate The sum of numbers of electrons that revolve in energy levels → **represents** → The atomic number of the element.

i.e. **The number of electrons that revolve in energy levels**
= The number of protons inside the nucleus of the atom
= The atomic number of the element.

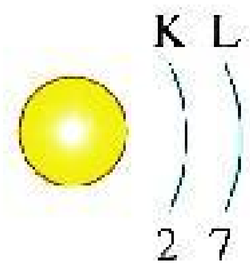
Exercise

Calculate the atomic number of each of the following elements :

1. Element (*X*) is located in the second period and in group (7A).
2. Element (Y) is located in the third period and in zero group.

Answer

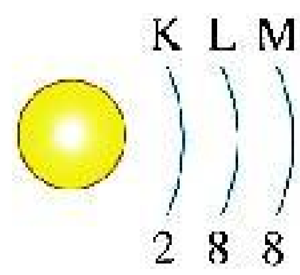
1. ∵ **Element (*X*) is located in :**



- Period (2). ∴ Its electrons are distributed in two energy levels.
- Group (7A). ∴ The outermost energy level contains 7 electrons.

∴ The atomic number of element (*X*) = 2 + 7 = 9

2. ∵ **Element (Y) is located in :**



- Period (3). ∴ Its electrons are distributed in three energy levels.
- Zero group. ∴ The outermost energy level contains 8 electrons.

∴ The atomic number of element (Y) = 2 + 8 + 8 = 18

Notes

In the modern periodic table

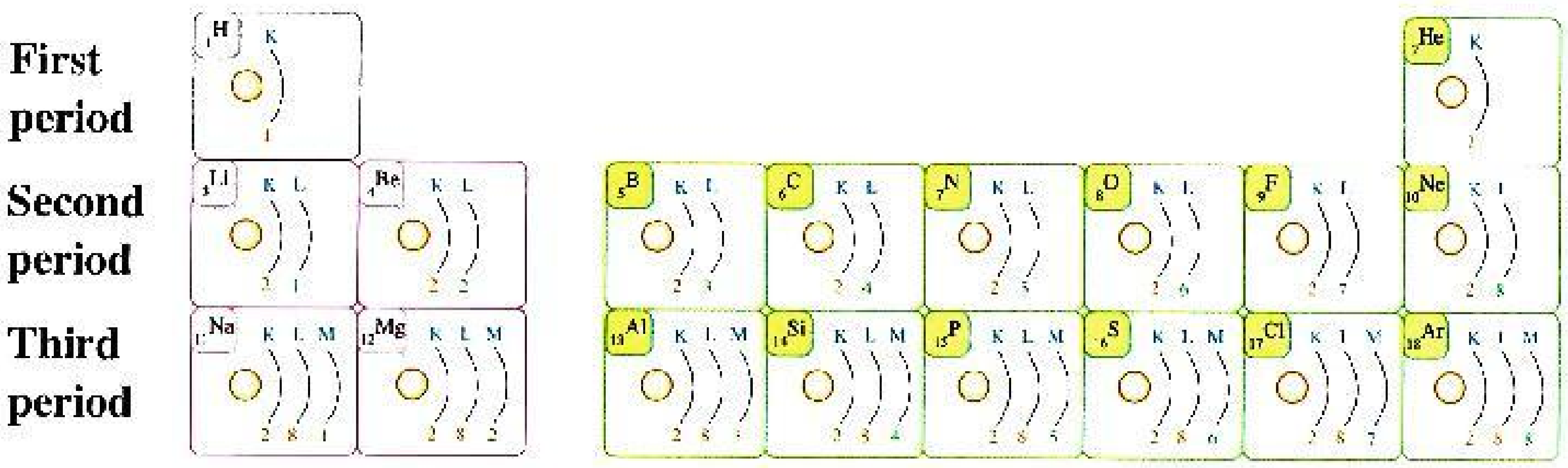
In the same group

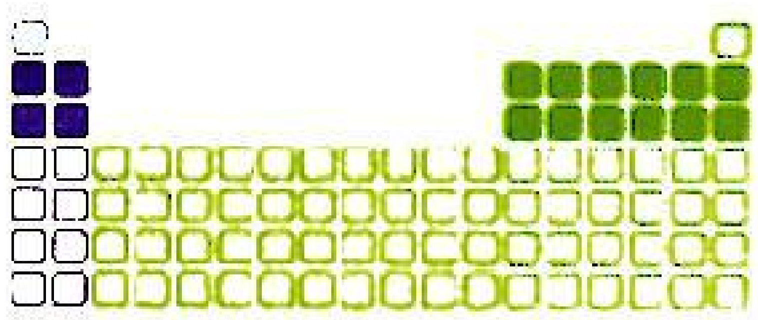
The atomic number of an element increases from the element preceding it by (8).

[except lithium element ($_3$Li) that its atomic number increases than hydrogen ($_1$H) by (2)].

In the same period

The atomic number of an element increases from the element preceding it by (1).





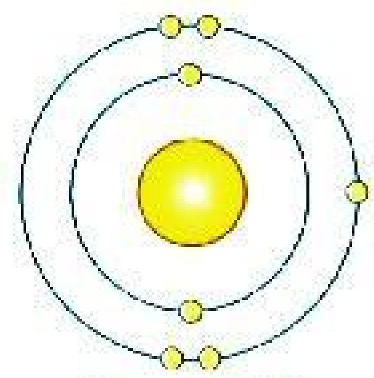
G.R. ***Scientists cannot discover a new element between sulphur ($_{16}S$) and chlorine ($_{17}Cl$).***

Because the atomic number of an element is an integer and it increases in the same period from one element to the following element by one.

Exercise

Study the opposite figure that shows the electronic configuration of element (Z) in the modern periodic table, then conclude the atomic number of :

1. Element (A) which follows it in the same period.
2. Element (B) which follows it in the same group.

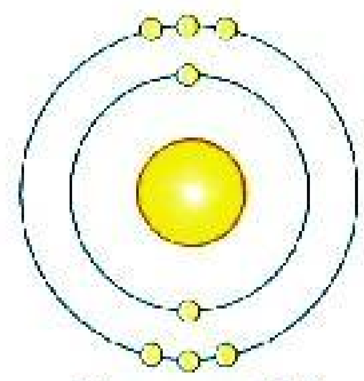


Element (Z)

Answer

1. ∵ The atomic number of element (Z) = 2 + 5 = 7

   ∴ The atomic number of element (A) that follows it in the same period = 7 + 1 = 8



Element (A)

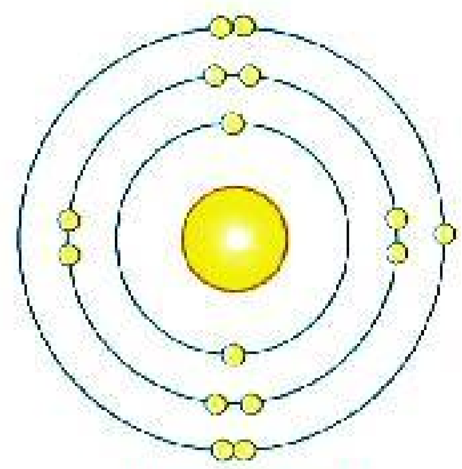
2. ∵ The number of energy levels of element (Z) = 2

   ∴ The number of energy levels of element (B) that follows it in the same group = 2 + 1 = 3

   ∵ The element (B) is located in the same group of element (Z)

   ∴ The number of electrons in the outermost energy level of both elements (B) and (Z) = 5

   ∴ The atomic number of element (B) = 2 + 8 + 5 = 15



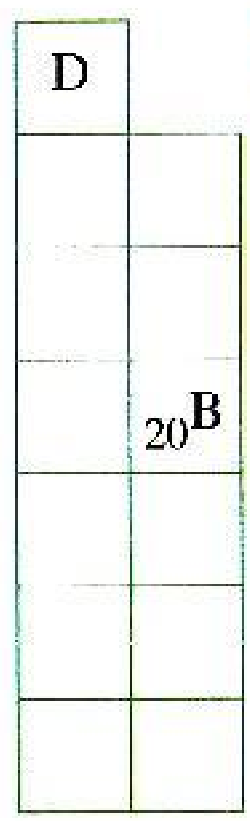
Element (B)

Question

The opposite figure represents a section of modern periodic table.

- Conclude the atomic number of :

1. Element (Y) that follows element (D) in the same group.
2. Element (X) that precedes element (B) in the same group.
3. Element (Z) that precedes element (B) in the same period.



TRY to answer worksheet 2 in the Notebook

Remember

Lesson One

✪ The most important attempts for classifying elements are :

1. **Mendeleev's periodic table.**
2. **Moseley's periodic table.**
3. **Modern periodic table.**

- In Mendeleev's periodic table, elements are classified in an ascending order according to their atomic weights.
- In Moseley's periodic table, elements are classified in an ascending order according to their atomic numbers.
- The scientist Rutherford discovered that the nucleus of the atom contains positively charged protons.
- The scientist Bohr discovered the main energy levels of the atom (7 in the heaviest atoms).
- In the modern periodic table, elements are classified in an ascending order according to :
  - Their atomic numbers.
  - The way of filling their energy sublevels with electrons.
- The number of known elements in the modern periodic table till now is 118, where 92 elements are abundant in Earth's crust, while the rest are prepared artificially.

✪ The modern periodic table consists of :

- 7 horizontal periods.
- 18 vertical groups.

- The modern periodic table is classified into 4 blocks (s, p, d, f).
- s-block is located on the left side of the periodic table, while p-block is located on the right side of the periodic table.
- d-block is located on the middle of the periodic table, while f-block is located below the periodic table.

✪ Determination of the position of the element in the modern periodic table :

- The period number of the element = Number of energy levels occupied by electrons.
- The group number of the element = Number of electrons in the outermost energy level.
- Elements of the same group are **similar** in the number of electrons in the outermost energy level, so they are similar in their chemical properties.
- Elements of the same period are **different** in the number of electrons in the outermost energy level, so they are different in their chemical properties.

Questions ? on lesson One

● Remember ● Understand ● Apply ● Higher skills School book questions.

Interactive Exercises

1. Choose the correct answer :

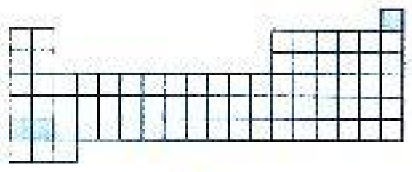
1. The number of elements in Mendeleev's periodic table is .... elements.
   a. 92 b. 118 c. 76 d. 67
2. The scientist who left empty cells in his table to be filled with discovered elements in future is ....
   a. Moseley. b. Rutherford. c. Bohr. d. Mendeleev.
3. Mendeleev classified the elements of each main group into .... subgroups.
   a. 2 b. 3 c. 4 d. 5
4. The nucleus of the atom contains ....
   a. positive electrons. b. negative electrons.
   c. negative protons. d. positive protons.
5. The scientist who discovered that the nucleus of the atom contains positively charged protons is ....
   a. Bohr. b. Mendeleev. c. Rutherford. d. Moseley.
6. The scientist .... discovered the main energy levels of the atom.
   a. Moseley b. Bohr c. Hofmann d. Mendeleev
7. The number of energy levels in the heaviest known atom reaches .... levels till now.
   a. 5 b. 7 c. 8 d. 10
8. The number of known elements in the modern periodic table till now is ....
   a. 216 b. 118 c. 316 d. 16
9. The number of elements which exist in nature is .... according to modern periodic table.
   a. 29 b. 118 c. 92 d. 102
10. The modern periodic table consists of .... horizontal periods.
    a. 7 b. 10 c. 14 d. 18
11. The modern periodic table consists of .... vertical groups.
    a. 7 b. 10 c. 14 d. 18
12. The modern periodic table consists of .... main blocks.
    a. 3 b. 4 c. 7 d. 8
13. The elements which occupy the middle block (d) in the periodic table are called .... elements.
    a. transition b. alkali c. acidic d. noble
14. The transition elements start to appear from the beginning of the .... period.
    a. second b. third c. fourth d. fifth

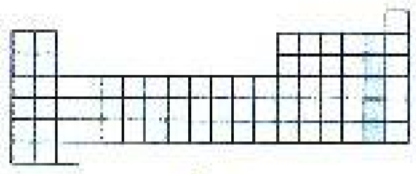
15. The block which contains the groups (1A) and (2A) in the periodic table is .... block.
    a. s b. p c. d d. f
16. Elements of d-block are arranged in .... groups.
    a. 2 b. 5 c. 6 d. 10
17. Lanthanides and actinides are located in the .... block.
    a. s b. p c. d d. f
18. Noble gases are located in group ....
    a. 7A b. 8 c. 17 d. 18
19. Elements of group (6A) in the periodic table have the same number of ....
    a. protons inside the nucleus.
    b. energy levels around the nucleus.
    c. neutrons inside the nucleus.
    d. electrons in outermost energy level.
20. Elements of the same period in the modern periodic table have the same ....
    a. number of protons inside the nucleus.
    b. atomic number.
    c. number of energy levels.
    d. number of electrons in outermost energy level.
21. The number of negative electrons in the atom in its normal state equals ....
    a. the number of protons. b. the number of neutrons.
    c. twice the number of protons. d. half the number of neutrons.
22. In the periodic table, the elements similar in their properties are located in the same ....
    a. period. b. group. c. nucleus. d. energy level.
23. The element which is located in period (3) and group (3A) is ....
    a. $_{13}Al$ b. $_{5}B$ c. $_{11}Na$ d. $_{15}P$
24. The atomic number of the element that is located in period (4) and group (2A) is ....
    a. 4 b. 18 c. 12 d. 20
25. The number of elements of period (4) is .... the number of elements of period (3).
    a. more than b. equal to c. less than d. half
26. The element whose atomic number (18) is ....
    a. transition element. b. inert gas. c. metallic element. d. halogen element.
27. The atomic number of the element that exists in group (7A) and period (2) is ....
    a. 12 b. 7 c. 9 d. 17
28. The element ($_{12}X$) is located in .... of the periodic table.
    a. period (2) and group (2A) b. period (2) and group (3A)
    c. period (3) and group (2A) d. period (3) and group (4A)

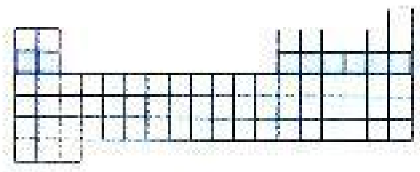
29. The chemical properties of calcium ($_{20}Ca$) are similar to those of ....

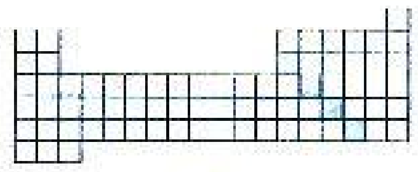
a. $_{19}K$ b. $_{12}Mg$ c. $_{25}Mn$ d. $_{3}Li$

30. The shaded elements in the periodic table .... have similar chemical properties.


a.


b.


c.


d.

2. Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Mendeleev	a. added the zero group to the periodic table.
2. Rutherford	b. discovered the main energy levels of the atom.
3. Moseley	c. corrected the atomic weights of some elements that were estimated wrongly.
4. Bohr	d. discovered that the nucleus of the atom contains protons.
	e. arranged the elements according to the number of neutrons.

3. Choose from columns (B) & (C) what suit them in column (A) :

(A)	(B)	(C)
1. d-block elements	a. are located on the left side of the periodic table.	A. include lanthanides and actinides.
2. f-block elements	b. are located on the right side of the periodic table.	B. take the letter (B) "except group (8)".
3. s-block elements	c. are located in the middle of the periodic table.	C. consist of 3 columns.
4. p-block elements	d. are located below the periodic table.	D. end by (0) group.
	e. are located at the top of the periodic table.	E. are arranged in two groups (1A) and (2A).

4. Put (✓) or (✗) and correct the wrong ones :

1. The chemical elements have been categorized in a table to ease its study. ( )
2. The modern periodic table is the first real table for classifying elements. ( )
3. The elements with similar properties have been put in horizontal periods. ( )
4. The number of recorded elements in Mendeleev's table is about 103 elements. ( )
5. Mendeleev discovered that the properties of elements were repeated periodically by the beginning of each new group. ( )

6. Mendeleev arranged the elements descendingly according to their atomic weights. ( )
7. Mendeleev put more than one element in the same place like nickel and cobalt. ( )
8. Moseley classified elements of each main group into two subgroups (A and B). ( )
9. The number of known elements till now is 92 elements. ( )
10. Rutherford discovered that the nucleus contains positively charged protons. ( )
11. The modern periodic table is classified into 5 blocks. ( )
12. Bohr discovered the main energy levels. ( )
13. Inert gases are located in zero group on the left side of the periodic table. ( )
14. Elements of d-block are arranged in 10 groups. ( )
15. Elements of p-block are organized in 5 groups. ( )
16. The transition elements groups are symbolized by (A). ( )
17. Elements of groups (A) are located in the middle of the periodic table. ( )
18. The number of energy levels occupied by electrons in the atom of the element indicates its group number. ( )
19. The period number of an element equals the number of electrons in the outermost energy level in its atom. ( )
20. The atomic number of every element increases by one electron over the element that precedes it in the same period. ( )
21. An element that is located in period (3) and group (2A), its atomic number is 13 ( )
22. Sodium ($_{11}Na$) element is located in group (1A) and period (3) in the modern periodic table. ( )
23. Both magnesium ($_{12}Mg$) and aluminium ($_{13}Al$) are located in the same group in the modern periodic table. ( )
24. Both nitrogen ($_{7}N$) and phosphorus ($_{15}P$) are located in the same group in the periodic table. ( )

5. Write the scientific term of each of the following :

1. • The first real periodic table for classifying elements.
   • A table in which the elements are arranged in an ascending order according to their atomic masses.
2. A table in which the elements are arranged in an ascending order according to their atomic numbers.
3. Positively charged particles found inside the nucleus of the atom.
4. A table in which the elements are arranged according to their atomic number and the way of filling their energy sublevels with electrons.
5. The vertical columns in the modern periodic table.
6. The horizontal rows in the modern periodic table.

7. • They are indicated by the letters K , L , M , N , O , P , Q
   • Their numbers reach 7 in the heaviest known atoms.
8. • A group of elements found in the middle of the periodic table and includes ten groups.
   • A kind of elements symbolized by letter (B).
   • Elements of d-block in the modern periodic table.
   • Elements which appear starting from period (4) in the modern periodic table.
9. The block that contains the groups from (3A) to (0).
10. Elements of zero group in the modern periodic table.
11. The block that contains the series of lanthanides and actinides.
12. It indicates the number of energy levels, which are occupied by electrons in the atom of an element.
13. It indicates the number of electrons in outermost energy level in the atom of an element.
14. The number of positive protons inside the nucleus of the atom of an element.

6. Complete the following statements :

1. The most important attempts to classify elements are .... , ... and .... periodic tables.
2. Mendeleev discovered that the atomic weights of elements increase on moving from .... side of the table to the .... side in horizontal rows, which were known later as ....
3. One advantage of Mendeleev's table is correcting the wrongly estimated .... of some elements.
4. The scientist Mendeleev arranged the elements ascendingly according to .... , while the scientist Moseley arranged them ascendingly according to ....
5. Moseley discovered, after studying .... rays properties, that the periodicity of elements properties is related to their .... and not to their ....
6. In Moseley's periodic table, the atomic number of each element increases by .... than the element before it in the same..........
7. The Newzealand scientist Rutherford discovered that the nucleus of the atom contains positively charged ....
8. Moseley put .... and .... series below the periodic table.
9. The Danish scientist .... discovered the main energy levels of the atom and their numbers reached .... in the heaviest known atoms.
10. Each main energy level contains a definite number of energy ....

11. In the modern periodic table, elements are arranged according to .... and ....
12. The number of known elements till now is .... elements, where .... elements are found in the Earth's crust, while the rest are prepared ....
13. The modern periodic table consists of .... horizontal periods and .... vertical groups.
14. Elements of s-block are located on the .... side of the periodic table and they are arranged in two groups which are .... and ....
15. Elements of p-block are located on the .... side of the periodic table and they are arranged in .... groups.
16. The modern number of group (6A) is ....,while that of group (6B) is ....
17. Groups of d-block take letter .... except group ...., which consists of .... vertical columns.
18. The d-block contains .... elements.
19. The transition elements start from period .... in the modern periodic table and consist of .... groups.
20. The modern number of zero group is ...., while that of group (5A) is ....
21. The vertical groups (1A) and (2A) are located on the .... side, while the rest of (A) groups are found in the .... side of the table.
22. The number of energy levels occupied by electrons in the atom of an element indicates its .... number, while the number of electrons in the outermost energy level in the atom of an element indicates its .... number.
23. If the atomic number of an element is 7, so it exists in period .... and group .... in the modern periodic table.
24. The atomic number of an element that is located in group (1A) and period (3) is ....
25. Element ($_{13}X$) is located in period .... and group .... in the modern periodic table.
26. An element whose 2^{nd} energy level contains one electron so, it is located in the .... period and group .... in the modern periodic table.
27. An element, whose electronic configuration is (2 , 8) so, it exists in .... group and period .... in the modern periodic table.
28. An element exists in the 3^{rd} period and group (2A) in the modern periodic table so, its atomic number equals ....
29. The elements ($_3X$) , ($_{11}Y$) , ($_{19}Z$) are similar in .... number, while the elements ($_3X$) , ($_4W$) , ($_5D$) are similar in .... number.

● Remember ● Understand ● Apply ● Higher skills

7. Complete the following tables :

(1)

Element	Its atomic number	Its electronic configuration			Its position in the periodic table	
		K	L	M	Period No.	Group No.
$_{6}C$				–		....
$_{8}O$				–		....
$_{....}Mg$				2		....
$_{....}Cl$					3	(7A)

(2)

Element	$_{20}Ca$	$_{15}P$	$_{10}Ne$	$_{1}H$
Electronic configuration :	+20 K L M N	+15 K L M	+10 K L	+1 K ...
No. of energy levels :				....
Period number :				....
No. of electrons in the outermost level :				....
Group number :				....

8. Who ... ?

1. • Made the first real periodic table.
   • Predicted the discovery of new elements and determined the values of their atomic weights.
   • Corrected the atomic weights of some elements which were estimated wrongly.
   • Published his periodic table which includes 67 elements in his book "principles of chemistry".
   • Classified each main group into two subgroups (a and b).
2. Discovered that the nucleus of the atom contains positively charged protons.
3. Discovered that the periodic properties of elements are related to their atomic numbers and not to their atomic weights.
4. Added the zero group to mendeleev's periodic table.
5. Discovered the main energy levels.

9. Give reasons for :

1. Many attempts are made by scientists for classification of elements.
2. Mendeleev left gaps (empty places) in his periodic table.

3. Mendeleev had to make a disturbance in the ascending order of atomic weights of some elements.
4. Mendeleev had to put more than one element in one cell.
5. Mendeleev classified the elements of each main group into two subgroups (A and B).
6. Elements of the same group have similar properties.
7. Both sodium ($_{11}Na$) and potassium ($_{19}K$) are located in the same group.
8. Both lithium ($_{3}Li$) and nitrogen ($_{7}N$) are located in the same period.
9. Scientists cannot discover a new element between sulphur ($_{16}S$) and chlorine ($_{17}Cl$).

10. Locate the following elements in the modern periodic table :

1. Hydrogen ($_{1}H$).
2. Nitrogen ($_{7}N$).
3. Carbon ($_{6}C$).
4. Neon ($_{10}Ne$).
5. Magnesium ($_{12}Mg$).
6. Chlorine ($_{17}Cl$).
7. Argon ($_{18}Ar$).
8. Calcium ($_{20}Ca$).
9. Oxygen ($_{8}O$).
10. Potassium ($_{19}K$).
11. Sulphur ($_{16}S$).
12. Boron ($_{5}B$).
13. Phosphorus ($_{15}P$).
14. Sodium ($_{11}Na$).
15. Aluminium ($_{13}Al$).

11. Mention the atomic numbers of the following elements :

1. An element lies in the first period and group (1A).
2. An element (X) lies in the first period and group zero.
3. An element lies in the third period and group (2A).
4. An element (Z) lies in the third period and group (7A).
5. An element lies in the third period and group (18).
6. An element (Y) lies in the second period and group (3A).

12. Choose the odd symbol out, then write the scientific term of others :

1. K / F / L / O / Q
2. s / k / d / f / p
3. $_{3}Li$ / $_{11}Na$ / $_{19}K$ / $_{12}Mg$
4. $_{2}He$ / $_{10}Ne$ / $_{18}Ar$ / $_{12}Mg$
5. $_{3}Li$ / $_{6}C$ / $_{4}Be$ / $_{13}Al$

13. Write the number which indicates each of the following :

1. Number of elements in Mendeleev's periodic table.
2. Number of main energy levels in the heaviest known atoms till now.
3. Number of known elements in the modern periodic table till now.

4. Number of elements available in Earth's crust according to modern periodic table.
5. Number of blocks in the modern periodic table.
6. Number of groups in s-block.
7. Number of groups in p-block.
8. Number of groups in d-block.

14. Compare between :

1. Mendeleev's periodic table, Moseley's periodic table and Modern periodic table [according to : the scientific principle of classification].
2. p-block and d-block [according to : the location in the modern periodic table – the number of groups of elements].
3. s-block and p-block [according to : the location in the modern periodic table – the number of groups of elements].
4. The element ($_{11}Na$) and element ($_{17}Cl$) in the modern periodic table [according to : the electronic configuration – period no. – group no. – the block symbol].

15. Variant questions :

(1) Write the contributions of the following scientists in chemistry :

1. Mendeleev. 2. Bohr. 3. Moseley. 4. Rutherford.

(2) What is the scientific principle upon which the elements are arranged in :

1. Mendeleev's periodic table ? 2. Moseley's periodic table ?

(3) What is the scientific base upon which the elements of the modern periodic table classified ?

(4) Mention the advantages and disadvantages of Mendeleev's periodic table.

(5) The element ($_{17}Y$) is an element in the periodic table, find :

1. Its electronic distribution. 2. Its group number.
3. Its period number.

(6) You have 3 elements ($_{12}X$) , ($_{4}Y$) , ($_{20}Z$) that are located in the same group. Determine each of the following [Giving reason for your answer] :

1. The number of the group.
2. In which block are they located ?
3. Which element of them lies in the third period.

(7) You have 3 elements X , Y and Z of atomic numbers 12 , 13 and 14 respectively, answer the following :

1. Write their electronic distribution.
2. Determine their positions in the modern periodic table.
3. In which block each of them is located ?

(8) A monovalent metallic element is located in the third period in the periodic table, its nucleus contains 12 neutrons.

1. Calculate :

   (a) Its atomic number. (b) Its mass number.

2. Determine :

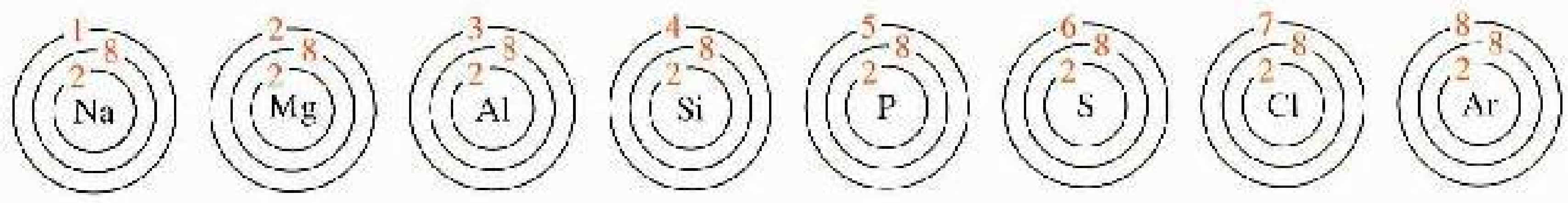
   (a) In which block is it located ? (b) Its group number.

16. Study the following figures, then answer the following questions :

(1) Is the opposite table a part of Mendeleev's periodic table or Moseley's periodic table ? Give a reason.

Li 7	Be 9.4	B 11	C 12	N 14	O 16	F 19
Na 23	Mg 24	Al 27.4	Si 28	P 31	S 32	Cl 35.5

(2) The following figures show the electronic configuration of elements of a certain period in the modern periodic table :



1. What is the number of this period ? Give a reason.
2. What is the number of the group of each of the following elements ....?

   (a) Magnesium. (b) Sulphur.

   (c) Argon.

3. Does this period contain an element from d-block ? Give a reason.
4. From this period, determine :

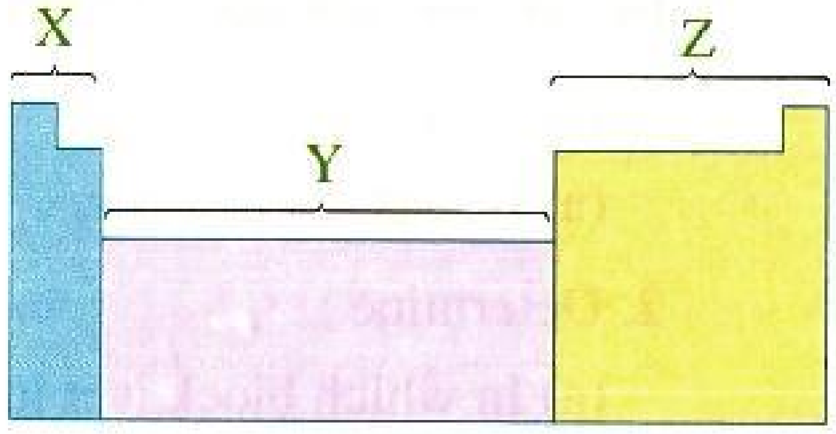
   (a) Elements of s-block. (b) Elements of p-block.

(3) The opposite figure represents a period of the modern periodic table :

A	B	C	$_6$D	E	X	Y	Z

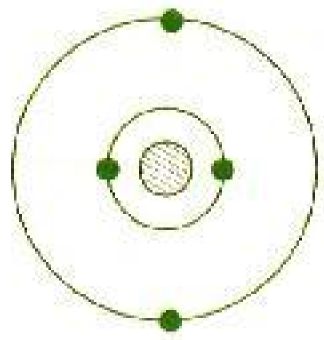
1. What is the number of this period ?
2. What is the number of the group of element (B) ?
3. What is the atomic number of the element which follows the element (A) in the same group ?
4. What is the block that element (C) belongs to ?
5. What is the type of element (Z) ? What is the valency of element (Y) ?

(4) **Look at the opposite figure, which represents a part of the modern periodic table, then answer the following :**



1. What are the names of the elements blocks indicated by letters X , Y and Z ?
2. What is the number of groups of each block ?
3. What is the modern (new) number of zero group and group (7A) ?

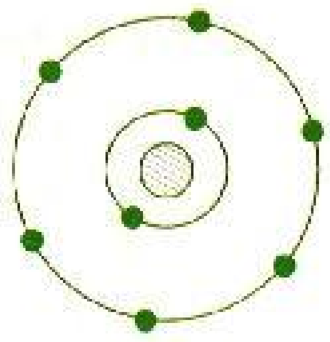
(5) **Study the opposite figure that shows the electronic configuration of an element (X) in the modern periodic table :**



Conclude the atomic number of the element which follows that element in :

1. The same period.
2. The same group.

(6) **Use the represented figure, which indicates the electronic configuration of an element to answer the following :**



1. What is the location of this element in the modern periodic table ?
2. What is the block that element belongs to ?
3. This element is located in the same group with .... in the modern periodic table.

a. $_{5}B$ b. $_{16}S$ c. $_{19}K$ d. $_{10}Ne$

(7) **The following table represents a part of the modern periodic table, answer the following questions :**

$_{3}Z$																	
A												$_{13}D$	Q		M	Y	
						B							T				X

1. Write the letter(s) of the element(s) which is/are :
   (a) among transition elements.
   (b) located in period (3) and group (6A).
   (c) among noble gases.
   (d) considered among s-block.
   (e) Element (Q) considered among .... block.

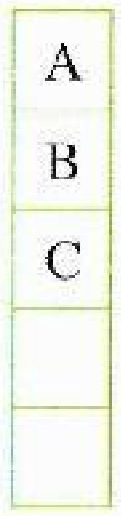
2. **Choose :**
   (a) The letter (A) represents .... element.
   a. $_{9}F$ b. $_{8}O$ c. $_{12}Mg$ d. $_{11}Na$
   (b) The letter (Y) represents .... element.
   a. $_{12}Mg$ b. $_{16}S$ c. $_{17}Cl$ d. $_{18}Ar$

(c) The element (B) is located in .... block.

a. s b. p c. d d. f

3. What is the atomic number of the element (M) ?

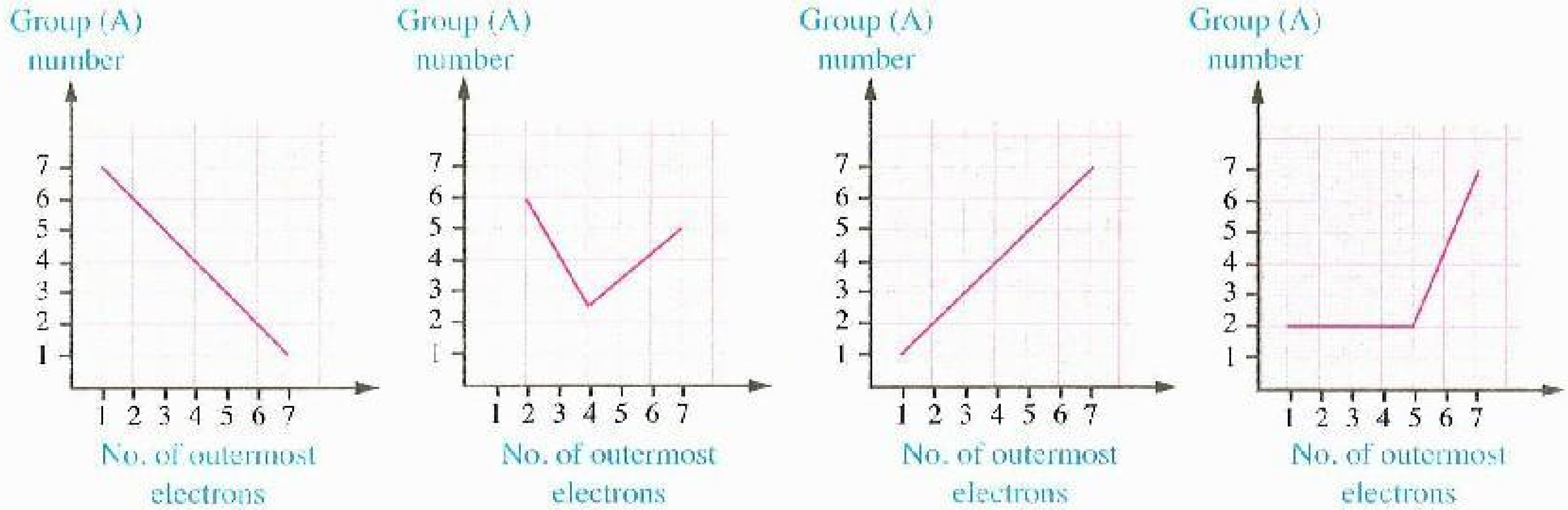
(8) In the opposite figure, if element (B) is located in period (3) and zero group.



1. Determine the atomic number of element (A).

2. (B) and (C) elements have the same number of ....

(9) Which of the following graphs represents the relation between the number of electrons in the outermost energy level and the group number, through (A) groups in the modern periodic table ?



(A) (B) (C) (D)

17. Creative thinking :

Imagine a new form of classification of elements whose atomic numbers range between 1 : 20 such that each group contains similar elements.

Thinking Skills Questions

1. Complete :

1. Elements whose atomic numbers from 1 : 18 occupy .... periods in the modern periodic table.
2. (X) and (Y) are two successive elements located in the same period, if the atomic number of (Y) is 15 , so the atomic number of (X) may be .... or ....
3. (A) and (B) are two successive elements in the same group, if the atomic number of (A) is 3, so the atomic number of (B) may be .... or ....

2. Choose the correct answer :

1. The number of elements that are located in the third period of the modern periodic table is ....

   a. 2 b. 8 c. 18 d. 32

2. ($^{31}_{15}P$) , ($^{32}_{16}S$) are two elements similar in the ....

   a. period number and number of neutrons.

   b. group number and number of protons.

   c. group number and number of neutrons.

   d. period number and number of protons.

3. The properties of the element, which has atomic number equals 17 are similar to the element which has atomic number equals ....

   a. 7 b. 9 c. 15 d. 20

4. An element which is located in the third period and group number 13, the number of neutrons in its nucleus equals 14 , so its mass number equals ....

   a. 30 b. 27 c. 24 d. 20

3. Give a reason for :

The modern periodic table consists of 7 horizontal periods.

4. Mention the atomic number of :

a. Metallic element (X) is divalent and located in the third period.

b. Inert gas which is located in the third period.

5. A metallic element (X) which is located in period (3) and when it reacts with oxygen, a compound its formula X_2O is formed :

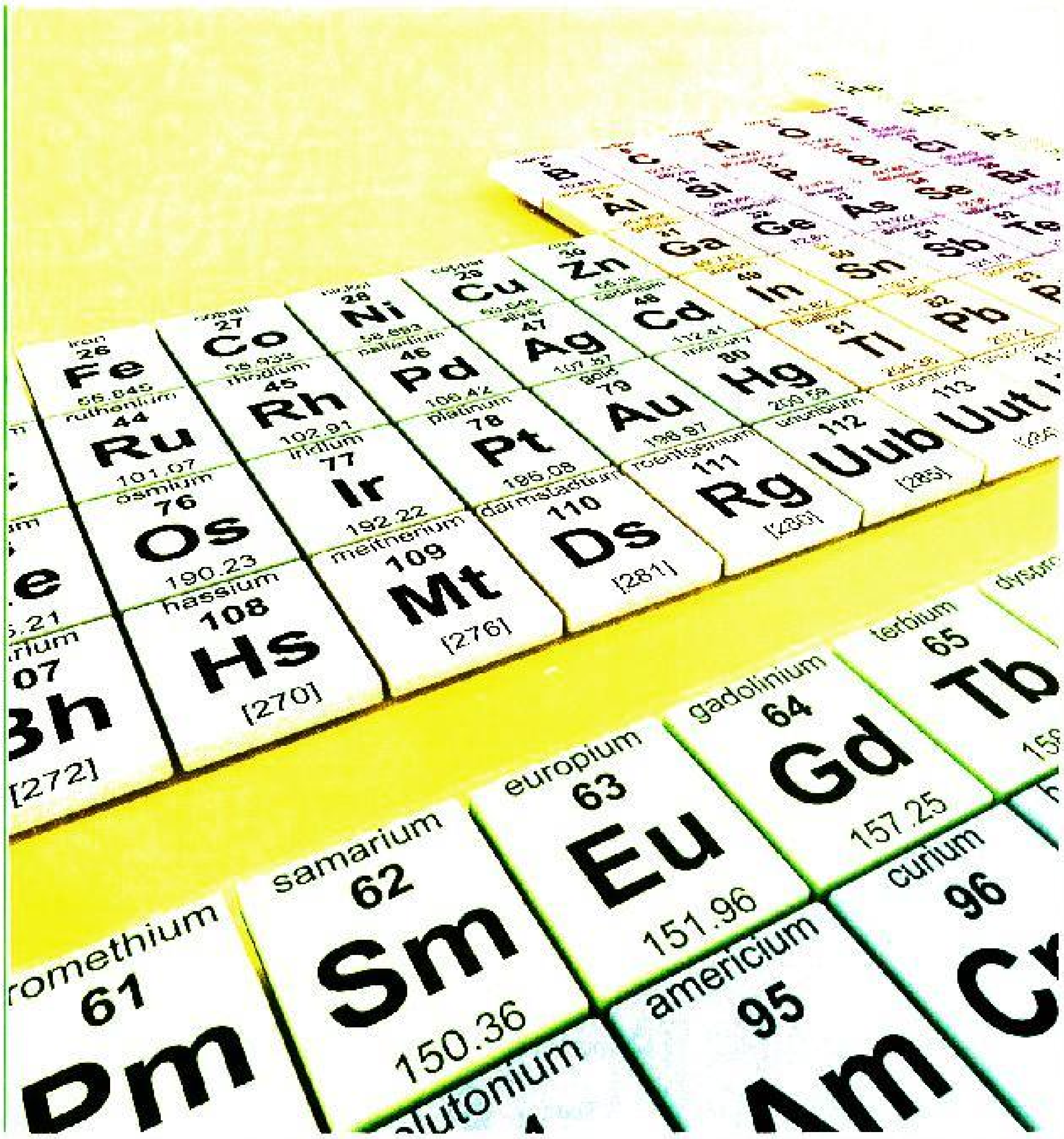
a. What is the group in which this element locate ?

b. Calculate the atomic number of this element.

c. Determine the block of this element.

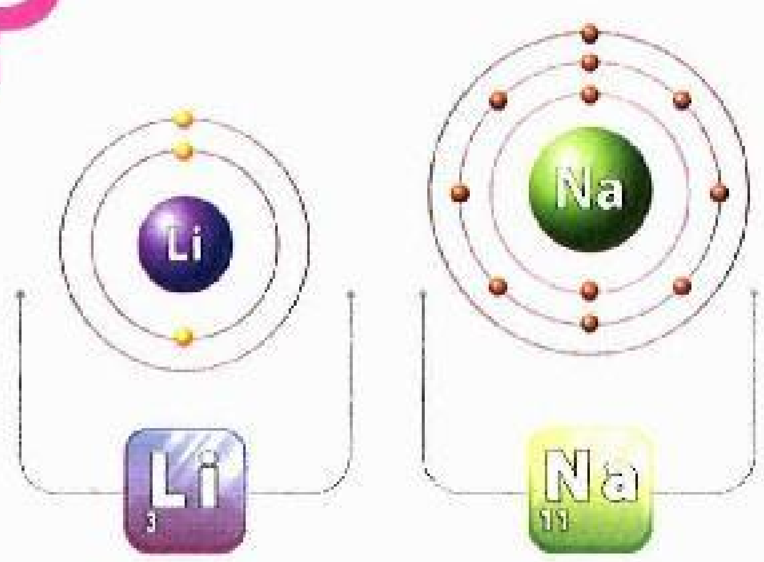
Lesson 2

Graduation of Elements Properties in the Modern Periodic Table



How does the electronic configuration of elements affect its properties?

There is a graduation of the elements properties in the modern periodic table and there is a relation between these properties and the electronic configuration of elements.



For Example :

The graduation of some properties of the elements in groups (A) and periods.

Such as

First	Second	Third
Atomic size property.	Electronegativity property.	Metallic and nonmetallic property.

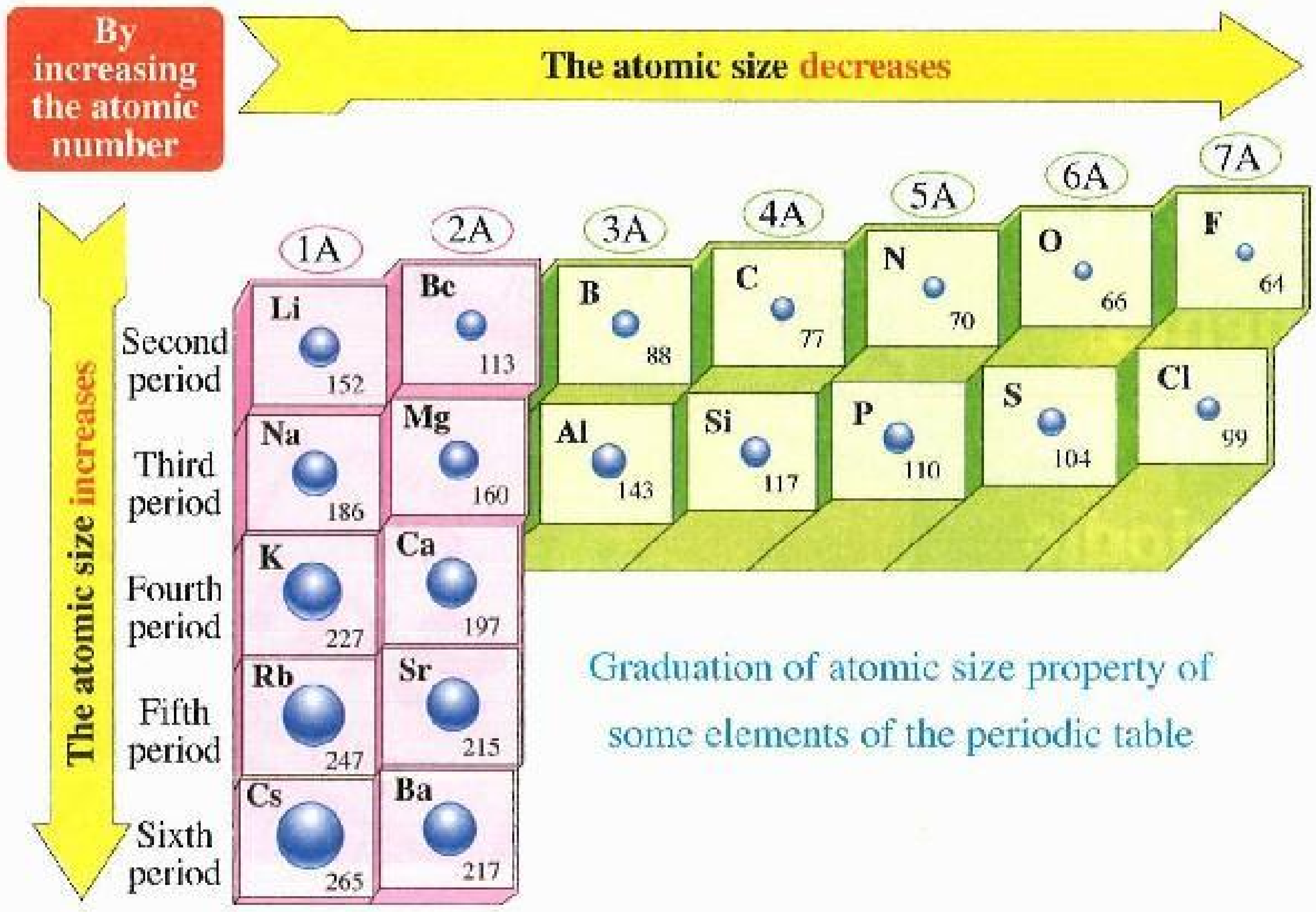
FIRST Atomic size property

The atomic size is determined by knowing the **atomic radius** of the atom and its measuring unit is **picometre (Pm)**.

NB **Picometre = Part of million of the million part of a metre.**
[**i.e.** picometre = 1×10^{-12} m].

Graduation of atomic size property of elements in the periodic table

∗ The following figure represents a section of the modern periodic table showing the values of the atomic sizes of some elements estimated by picometre unit.



Graduation of atomic size property of some elements of the periodic table

We find that :

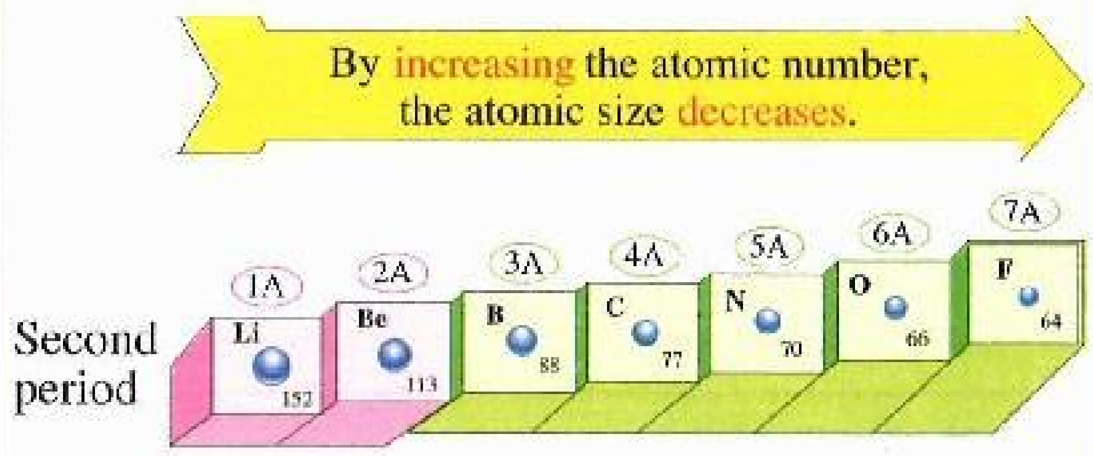
Atomic size in the same period

The atomic size decreases from left to right in the same period G.R.
Because by increasing the atomic number in the same period, the attraction force between the positive nucleus and the negative electrons in the outermost energy level increases.

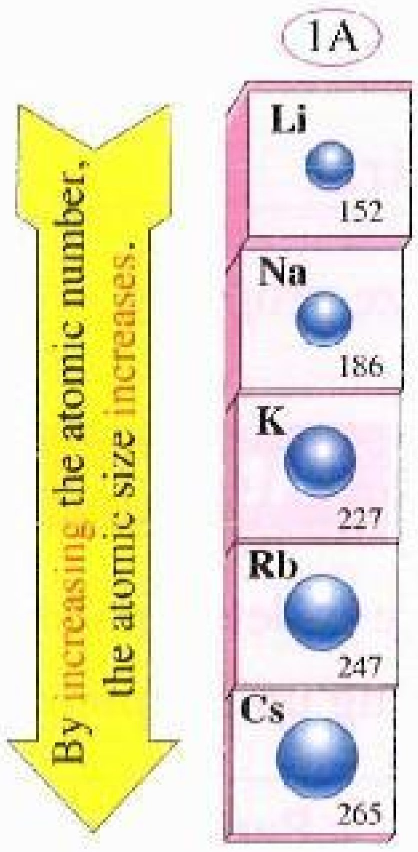
Atomic size in the same group

The atomic size increases from up to down in the same group G.R.
Because by increasing the atomic number in the same group, the number of energy levels occupied by electrons increases.

Examples



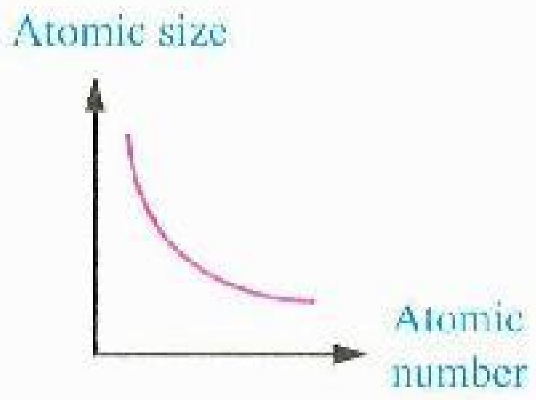
Atomic sizes for elements of second period



Atomic sizes for elements of group 1 (1A)

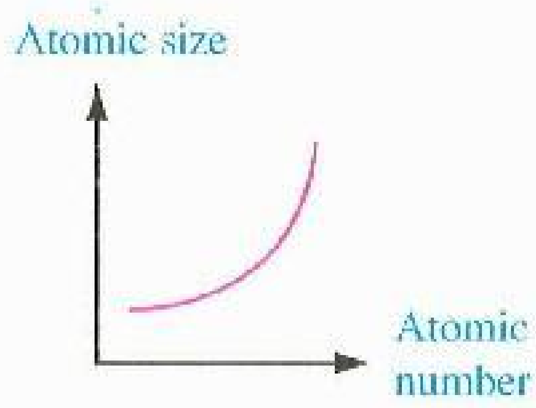
From the previous explanation, we conclude that :

The atomic size of the elements of the same period is inversely proportional to the atomic number.



The relation between the atomic size and the atomic number of the elements of the second period

The atomic size of the elements of the same group is directly proportional to the atomic number.



The relation between the atomic size and the atomic number of the elements of group 1 (1A)

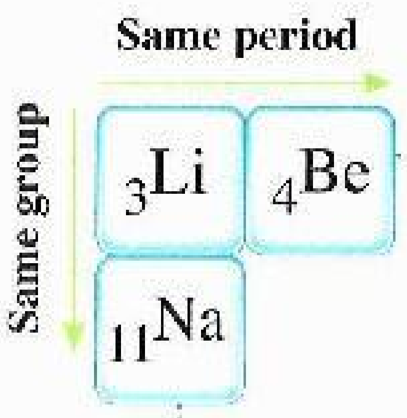
Notes

- **The elements of group (1A) are the largest atomic size elements in the modern periodic table, where :**

- **Fluorine (F)** is the smallest atomic size element in the modern periodic table, where it is located at the top right of the periodic table.
- **Cesium (Cs)** is the largest atomic size element in the modern periodic table, where it is located at the bottom left of the periodic table.

Application : The atomic size of lithium ($_3Li$) is greater than that of beryllium ($_4Be$) and smaller than that of sodium ($_{11}Na$). **Can you explain why ?**

$$_{11}Na > {}_3Li > {}_4Be$$



*Because by increasing the atomic number in **the same period**, the attraction force between the positive nucleus and the negative electrons in the outermost energy level increases, so the atomic size of lithium ($_3Li$) is greater than that of beryllium ($_4Be$).*

*Because by increasing the atomic number in **the same group**, the number of energy levels occupied by electrons increases, so the atomic size of lithium ($_3Li$) is smaller than that of sodium ($_{11}Na$).*

Exercise

Arrange these elements ascendingly according to the atomic size :

[$_6C$ / $_9F$ / $_8O$ / $_7N$]

Answer

$_6C > _7N > _8O > _9F$

Idea of answer :

These elements are located in the same period and the atomic size of elements in the same period decreases by increasing the atomic number.

SECOND Electronegativity property

* You have known from the previous studies that the atoms of elements combine together by chemical bonds forming elements molecules or compounds molecules.
* The ability of atoms of elements differs to attract the electrons of the bond which is known as the electronegativity.

Electronegativity:

It is the ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.

* Each element has its own value of electronegativity.

G.R. ***Inert gases haven't electronegativity.***
Because they don't combine with other elements under the normal conditions.

The difference in electronegativity

The difference in electronegativity between combined elements plays a main role for determination the kind of the formed compound, it may be :

- **A polar compound.**
- **A non-polar compound.**
- **An ionic compound.**

Enrichment information

*If the difference in electronegativity between elements of a covalent compound molecule equals zero, the bond in this molecule is described as **pure covalent bond**. As in diatomic gases like oxygen molecule (O_2).*

* **Now,** we will study **the polar compounds only.**

Polar compounds

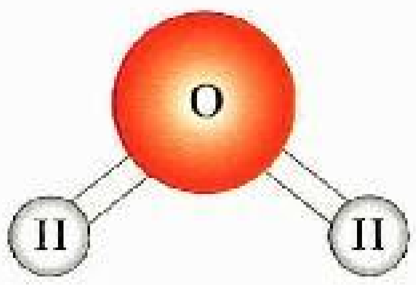
Polar compound:

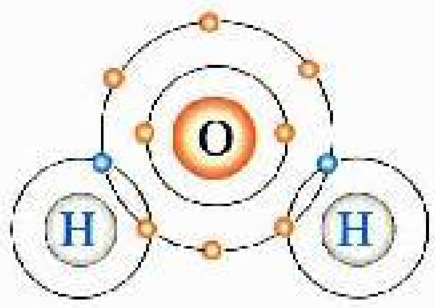
It is a covalent compound, in which the difference in electronegativity between its elements is relatively high.

Examples :

1 Water molecule (H_2O) :

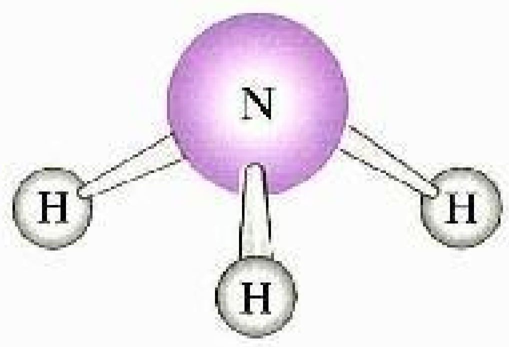
- It consists of combination of **one oxygen** atom with **two hydrogen** atoms.

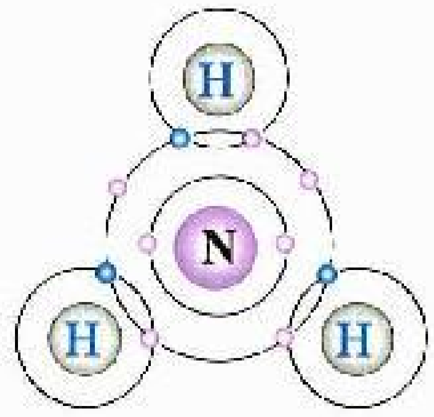




2 Ammonia molecule (NH_3) :

- It consists of combination of **one nitrogen** atom with **three hydrogen** atoms.





G.R.

- ***Water and ammonia are from polar covalent compounds.***
  Because the difference in electronegativity between the elements of each of them is relatively high.
- ***The polarity of water molecule is stronger than that of ammonia molecule.***
  Because the difference in electronegativity between oxygen and hydrogen in water molecule **is greater than** the difference between nitrogen and hydrogen in ammonia molecule.

For illustration

Compound	The difference in electronegativity between its elements
Water (H_2O)	Oxygen Hydrogen 3.5 – 2.1 = 1.4
Ammonia (NH_3)	Nitrogen Hydrogen 3 – 2.1 = 0.9

TRY to answer worksheet **3** in the Notebook

Question

Put (✓) or (✗) :

1. The atomic size increases in the same group by increasing the atomic number. ( )
2. Water molecule is a polar compound, because the difference in electronegativity between its elements is relatively low. ( )

THIRD Metallic and nonmetallic property

Elements in the nature are classified according to their properties and electronic structure into four main kinds

1. Metals
2. Nonmetals
3. Metalloids (semi-metals)
4. Noble gases

1 Metals

Metals:

They are the elements, which have less than four electrons in their outermost energy levels.

For illustration

Berzelius was the first scientist who classified the elements into metals and nonmetals.

*** During the chemical reactions :**

- **The atoms of metallic elements tend to lose their outermost electrons (valency shells electrons) and change into positive ions G.R.**

  To reach the electronic configuration of the nearest inert gas preceding them in the periodic table.

Positive ion:

It is an atom of a metallic element which lost one electron or more during the chemical reaction.

- The positive ions carry a number of **positive charges** equals to the number of the **lost electrons**.

Examples :

Metal during the chemical reaction	Electronic configuration K	L	M	Positive ion	Electronic configuration K	L	The nearest preceding inert gas
Sodium ($_{11}Na$)	2	8	1	Na^+	2	8	Neon
Magnesium ($_{12}Mg$)	2	8	2	Mg^{+2}	2	8	$_{10}Ne$
Aluminium ($_{13}Al$)	2	8	3	Al^{+3}	2	8	(2 , 8)

NB The electronic configuration of **(Na^+)** , **(Mg^{+2})** and **(Al^{+3})** ions is similar to the electronic configuration of neon (**$_{10}Ne$**) atom.

2 Nonmetals

Nonmetals:

They are the elements, which have more than four electrons in their outermost energy levels.

⁕ During the chemical reactions :

- **The atoms of nonmetallic elements tend to gain electrons and change into negative ions G.R.** To reach the electronic configuration of the nearest inert gas following them in the periodic table.

Negative ion:

It is an atom of a nonmetallic element which gained one electron or more during the chemical reaction.

- The negative ions carry a number of **negative charges** equals to the number of the **gained electrons**.

Examples :

Nonmetal during the chemical reaction	Electronic configuration			Negative ion	Electronic configuration			The nearest following inert gas
	K	L	M		K	L	M	
Phosphorus ($_{15}P$)	2	8	5	P^{-3}	2	8	8	Argon
Sulphur ($_{16}S$)	2	8	6	S^{-2}	2	8	8	$_{18}Ar$
Chlorine ($_{17}Cl$)	2	8	7	Cl^{-}	2	8	8	(2 , 8 , 8)

NB The electronic configuration of (P^{-3}) , (S^{-2}) and (Cl^{-}) ions is similar to the electronic configuration of argon ($_{18}Ar$) atom.

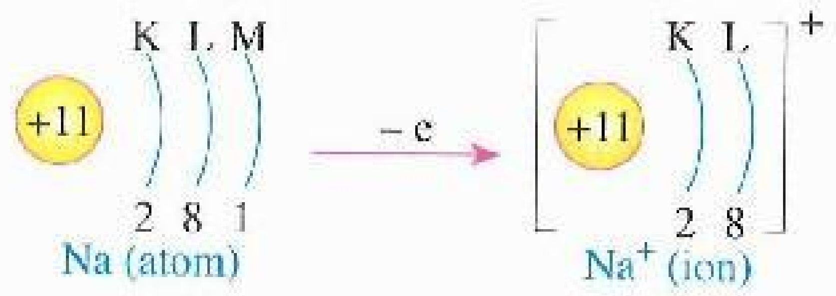
G.R.

- ***Both sodium ion (Na^{+}) and fluoride ion (F^{-}) have the same number of electrons.***
  Because during the chemical reaction, sodium atom ($_{11}Na$) loses one electron and fluorine atom ($_{9}F$) gains one electron, so the number of electrons becomes 10 electrons in each of the two ions.
- ***During the chemical reaction, chlorine ($_{17}Cl$) atom tends to form a negative ion.***
  Because ($_{17}Cl$) is a nonmetal element, so it tends to gain one electron and changes into a negative ion.

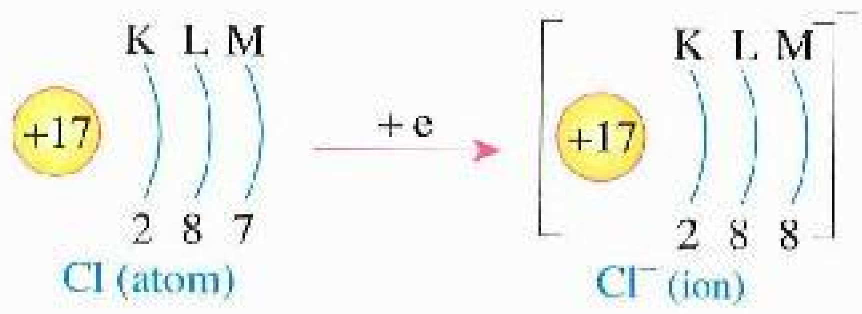
Comparison between the positive ion and the negative ion :

The positive ion +	The negative ion −
- It is an atom of a **metallic** element that **loses** one electron or more during the chemical reaction.	- It is an atom of a **nonmetallic** element that **gains** one electron or more during the chemical reaction.
- The number of its electrons is **less than** that of its protons.	- The number of its electrons is **more than** that of its protons.
- It carries a number of **positive charges equals to** the number of the **lost electrons**.	- It carries a number of **negative charges equals to** the number of the **gained electrons**.
- The number of its energy levels is **less than** the number of energy levels in its atom.	- The number of its energy levels is **equal to** the number of energy levels in its atom.
- Its electronic configuration is similar to that of the nearest inert gas **preceding** its atom in the periodic table.	- Its electronic configuration is similar to that of the nearest inert gas **following** its atom in the periodic table.

Example :



Example :



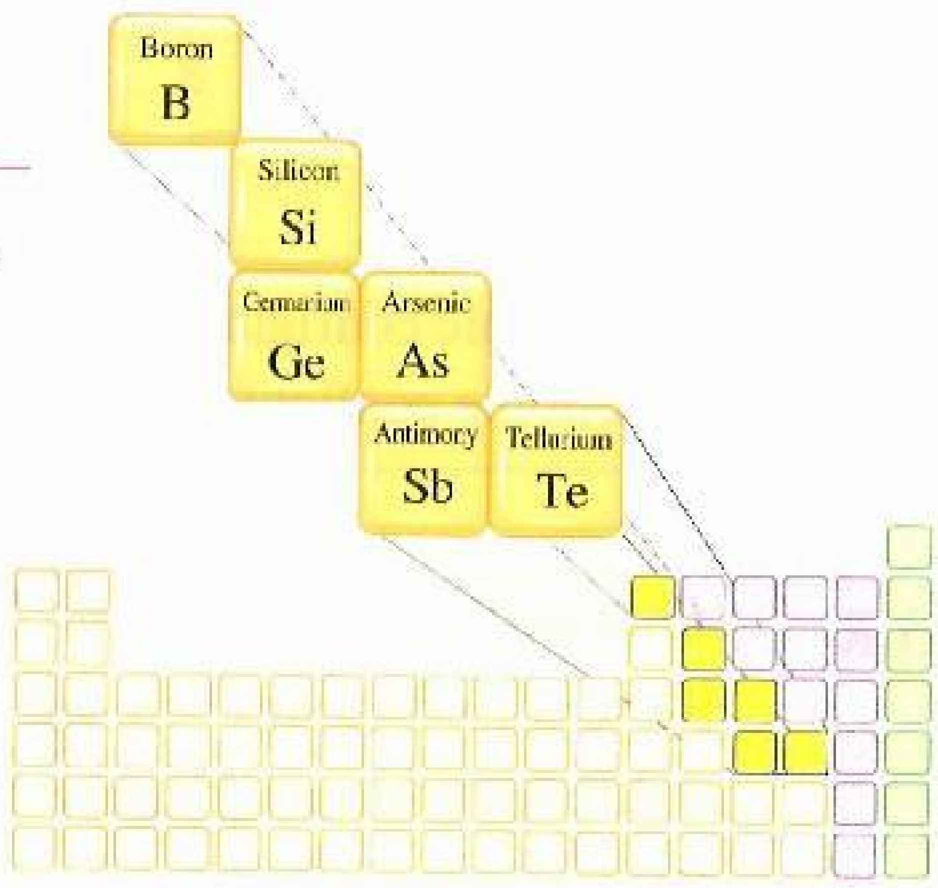
3 Metalloids (semi-metallic elements)

Metalloids are located in **p-block**.

Metalloids:

They are the elements, which have the properties of both metals and nonmetals.

They are :
- Boron (B).
- Silicon (Si).
- Germanium (Ge).
- Arsenic (As).
- Antimony (Sb).
- Tellurium (Te).



The position of metalloids in the periodic table

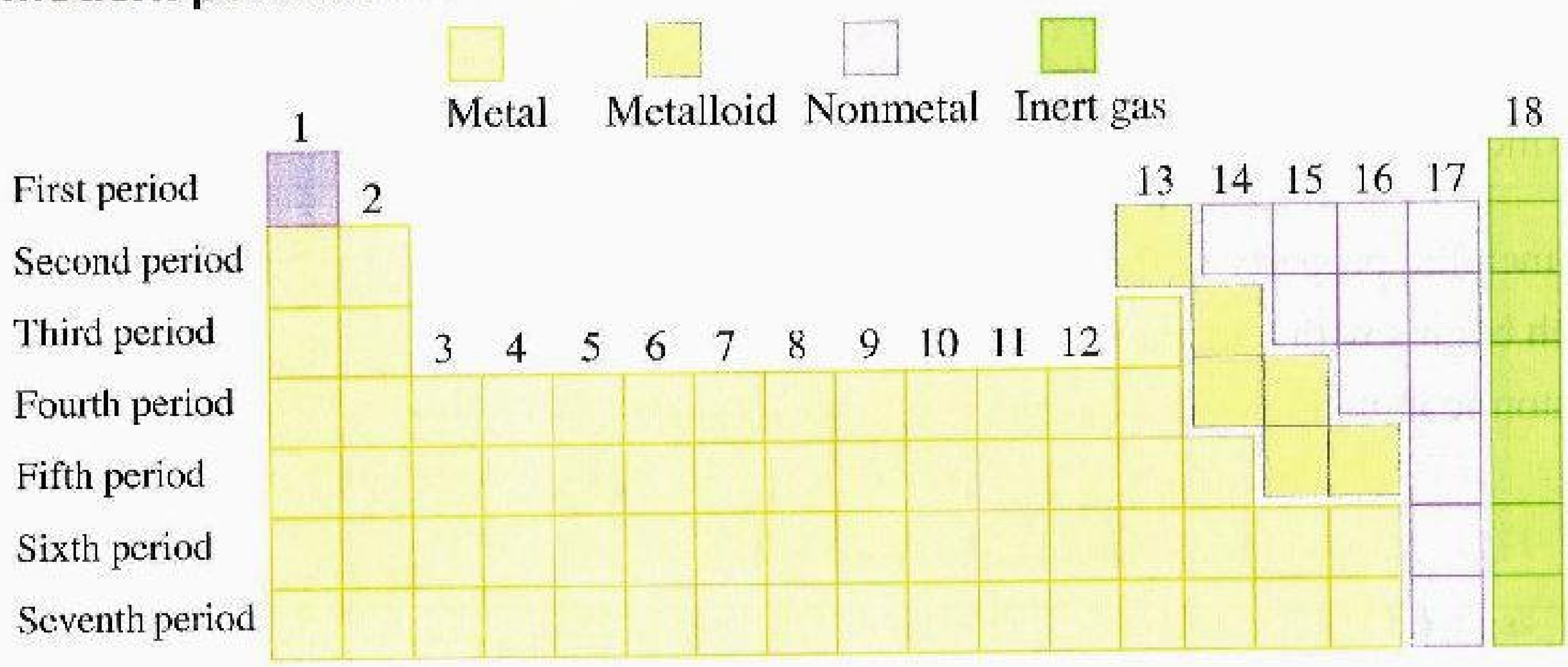
For illustration

It is difficult to know the metalloids from their electronic structure due to the difference in numbers of the electrons in their valencies shells as shown in the opposite table :

$_{5}B$	$_{14}Si$	$_{33}As$	$_{52}Te$
3	4	5	6

Graduation of metallic and nonmetallic property of elements in the periodic table

* **We conclude from the following figure which represents a section of the modern periodic table that :**



In the same period

1. Each period **starts** with **a strong metal** "except the first period".
2. By increasing the atomic number (as we go from **left** to **right**), the **metallic** property **decreases** till we reach **metalloids.**
3. Then the **nonmetallic** property appears and increases by increasing the atomic number till we reach the **strongest nonmetal** in group 17 (7A).
4. Then the period ends with an **inert gas** in group 18

Application :

The graduation of metallic and nonmetallic property within third period.

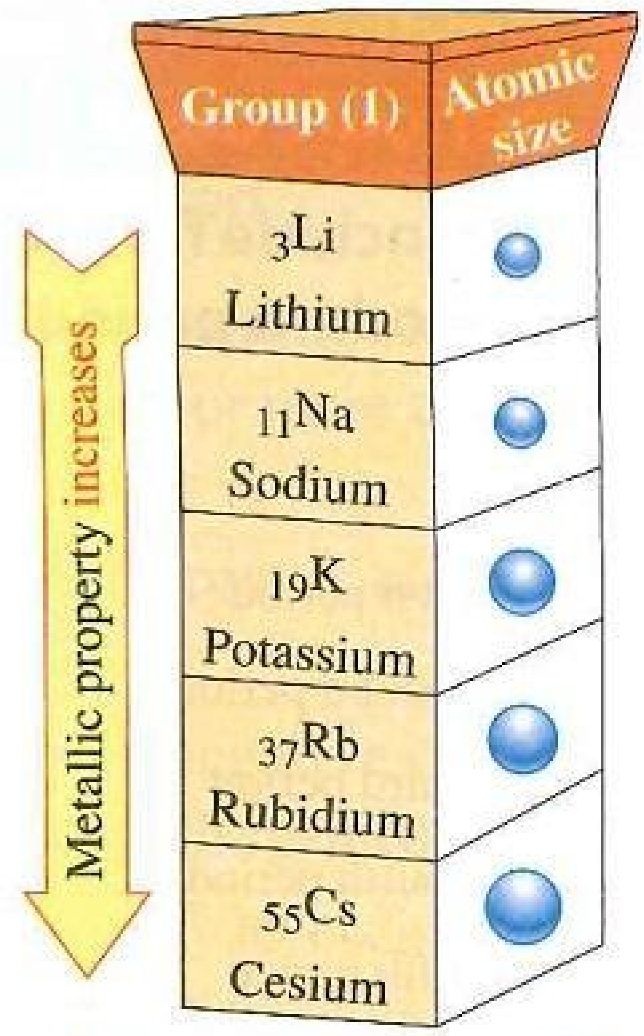
By increasing the atomic number, the metallic property decreases and nonmetallic property increases.

Third period	$_{11}$Na Sodium	$_{12}$Mg Magnesium	$_{13}$Al Aluminium	$_{14}$Si Silicon	$_{15}$P Phosphorus	$_{16}$S Sulphur	$_{17}$Cl Chlorine	$_{18}$Ar Argon
Electronic configuration	2,8,1	2,8,2	2,8,3	2,8,4	2,8,5	2,8,6	2,8,7	2,8,8
Kind of element	Strong metal	Metal	Metal	Metalloid	Non-metal	Non-metal	Strong non-metal	Inert gas

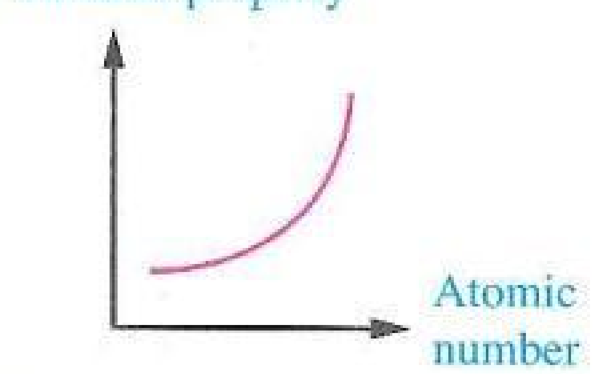
In group which starts with a metal

- **The metallic property increases gradually as we go from top to bottom as in group (1A) G.R.** Because as the atomic number increases, the atomic size of metallic elements increases, so the ability to lose the outermost electrons increases.

- The metallic property of the elements of the group which begins with a metal is **directly proportional** to the atomic number, as shown in the following figure :



Arrangement of group (1) according to metallic property



The relation between the metallic property and the atomic number of the elements of group (1A)

Note

In group (1A) :

- ***Lithium (Li)*** is the *lowest* element in the metallic property.
- ***Cesium (Cs)*** is the *strongest* element in the metallic property.

G.R. ***Cesium is considered as one of the strongest metallic elements.***
Because cesium has the largest atomic size, so it can lose its valency electron easily.

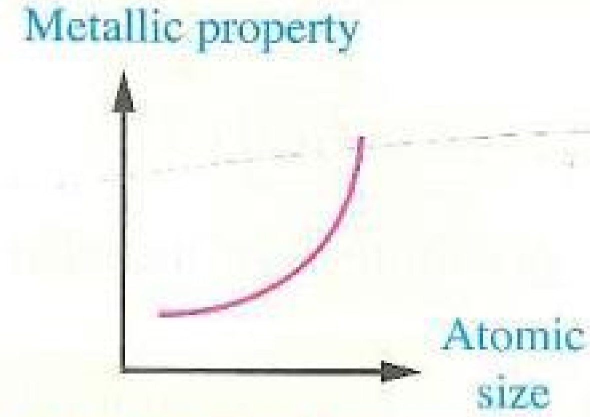
Exercise

Mention with drawing, the type of the relation between atomic size and metallic property for elements of the same group.

Answer

There is a direct relationship between the atomic size of an element and its metallic property.

i.e. *By increasing the atomic size, the metallic property increases.*



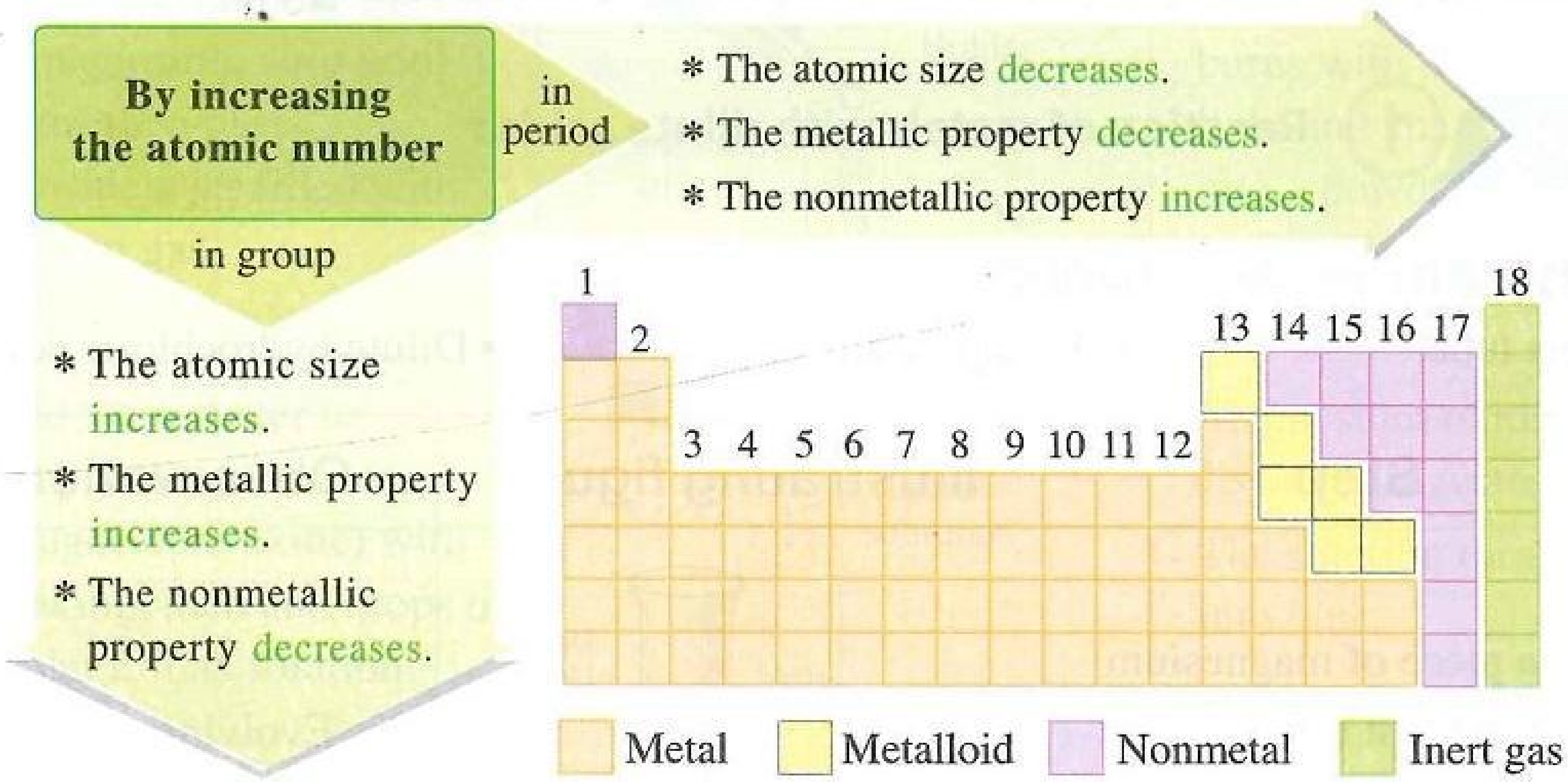
The relation between the metallic property and the atomic size

Note

In nonmetallic groups (groups which start with nonmetal) :
The nonmetallic property decreases gradually as we go from top to bottom as in group (7A).

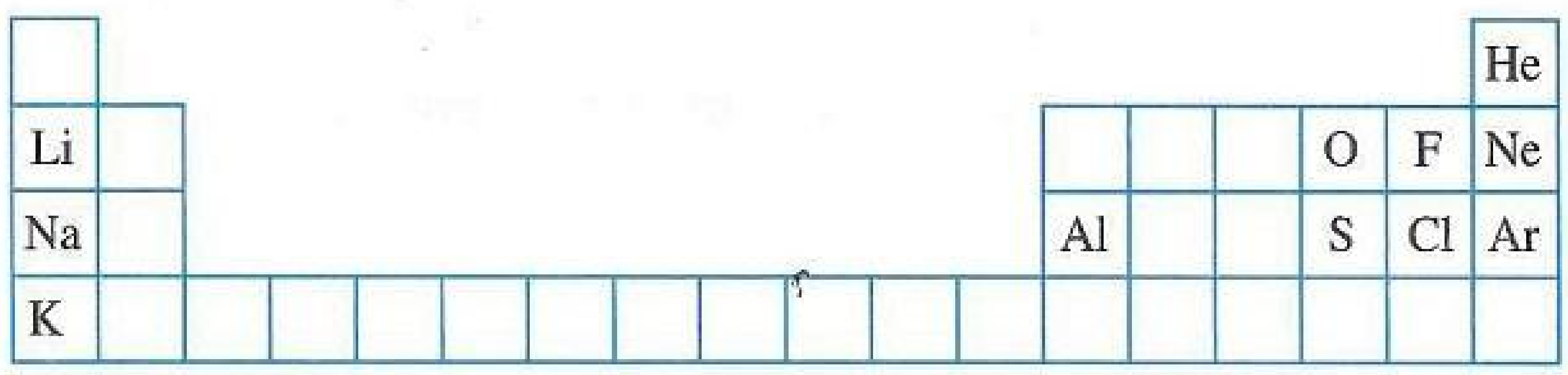
TRY To Answer Worksheet 4 in the Notebook

*** The following figure shows the graduation of properties of elements in the modern periodic table :**



Question

The following figure represents a section of the periodic table.



Determine the symbol which indicates the following :

1. The largest atomic size element of the third period. (............)
2. An element, whose electronic configuration is similar to the electronic configuration of the ion of (K) element. (............)
3. A nonmetal, whose electronic configuration of its ion is similar to the electronic configuration of (Ar) element. (............)
4. An element, whose electronic configuration of its ion is similar to the electronic configuration of (He) element. (............)
5. A metal, whose electronic configuration of its ion is similar to the electronic configuration of (Ne) element. (............)

Chemical properties of metals

*** To know the chemical properties of metals, do the following activities :**

Activity 1 Reaction of metals with dilute acids :

Substances and tools:

- A test tube.
- A magnesium strip.
- Dilute hydrochloric acid.

Step	Illustrating figure	Observation
Put a piece of magnesium strip in a test tube and add some dilute hydrochloric acid (HCl).		Evolving of gas bubbles.

Conclusion:

Active metals such as magnesium (Mg) react with dilute acids (as hydrochloric acid) forming ***a salt of an acid*** and ***hydrogen gas*** which burns with a pop sound on approaching a burning match to it.

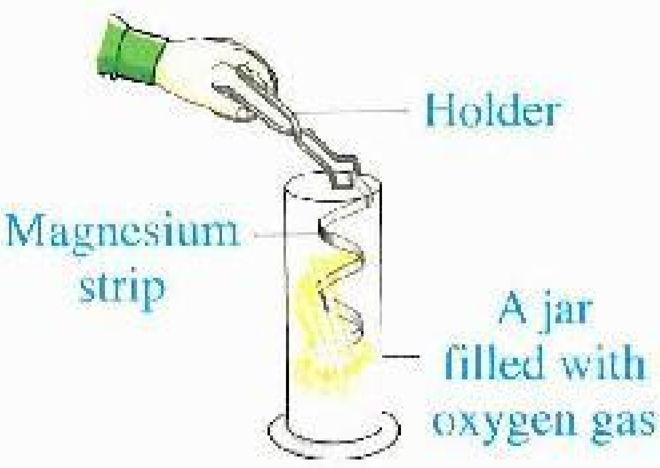
$$\text{Active metal} + \text{Acid} \xrightarrow{\text{dil.}} \text{Salt of an acid} + \text{Hydrogen gas}$$

$$\underset{\text{Magnesium}}{Mg} + \underset{\text{Hydrochloric acid}}{2HCl} \xrightarrow{\text{dil.}} \underset{\text{Magnesium chloride}}{MgCl_2} + \underset{\text{Hydrogen gas}}{H_2 \uparrow}$$

Activity 2 Reaction of metals with oxygen :

Substances and tools:

- A magnesium strip.
- A jar filled with oxygen.
- Water.
- Violet litmus solution.

Steps	Illustrating figures	Observations
1. Ignite one end of a magnesium strip until it burns then put it inside a jar filled with oxygen gas.		- Magnesium strip burns with a bright light and changes into a powder (magnesium oxide).
2. Add some water to the produced substance (magnesium oxide) with shaking, then add drops of violet litmus solution.		- Magnesium oxide dissolves in water. - The solution turns into blue.

Conclusion:

- Metals such as magnesium (Mg) react with oxygen forming ***metal oxides,*** which are known as ***"Basic oxides"***.

$$\text{Metal} + \text{Oxygen} \xrightarrow{\text{heat}} \text{Basic oxide}$$

$$\underset{\text{Magnesium}}{2Mg} + \underset{\text{Oxygen}}{O_2} \xrightarrow{\Delta} \underset{\text{Magnesium oxide}}{2MgO}$$

- Some basic oxides (such as magnesium oxide) dissolve in water forming ***alkaline solutions*** which turn violet litmus solution into ***blue***.

$$\text{Basic oxide} + \text{Water} \longrightarrow \text{Alkali}$$

$$\underset{\text{Magnesium oxide}}{MgO} + \underset{\text{Water}}{H_2O} \longrightarrow \underset{\text{Magnesium hydroxide}}{Mg(OH)_2}$$

Basic oxides:

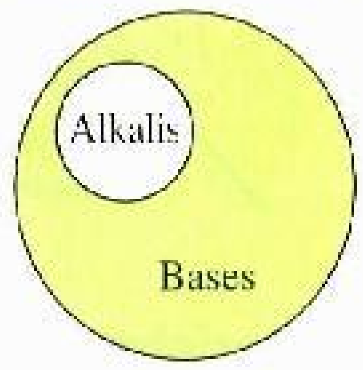
They are metallic oxides, some of them dissolve in water forming alkaline solutions.



Alkaline solution turns litmus solution into blue

G.R. ***All bases aren't considered alkalis.***

Because alkalis are bases dissolve in water, but not all bases dissolve in water.



Enrichment information

A mixture of MgO, $MgCl_2$ and H_2O is used in making stones for making blades of knives which are very thin (sharpening knives).

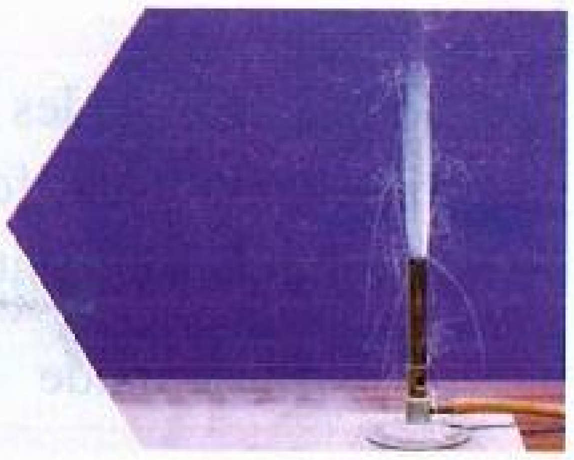
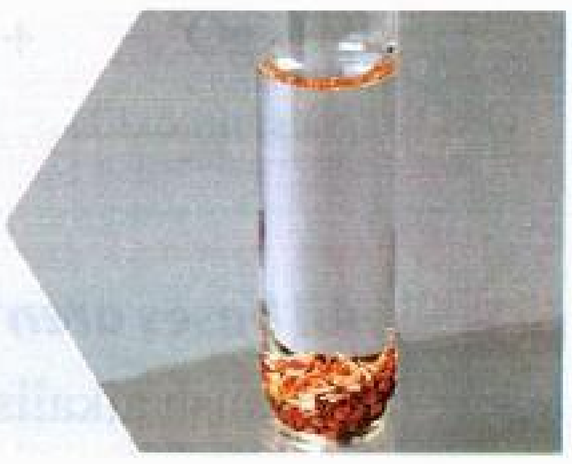
Chemical activity series

* Metals are arranged according to the degree of their chemical activity in a table known as **"Chemical activity series"**.

Chemical activity series:
It is the arrangement of metals in a descending order according to the degree of their chemical activity.

* **The following table shows the difference in the behaviour of some metals with water according to their location in the chemical activity series.**

The degree of chemical activity decreases ↓

Metals	Reaction with water	
K Potassium Na Sodium	They **react instantly** with water and hydrogen gas evolves which burns with a pop sound.	
Ca Calcium Mg Magnesium	They **react very slowly** with cold water.	
Zn Zinc Fe Iron	They **react at high temperatures** with hot water vapour only.	
Cu Copper Ag Silver	They **don't react** with water.	

▶ **Enrichment information**

The rise in sodium ion concentration (Na^+) in the body causes a rise in blood pressure, so high blood pressure patients are advised to reduce table salt in their food.

Life application Steps to clean silver tools :

1. Cover the bottom of a plastic plate with an aluminium paper (foil), whereas the bright surface is upward.
2. Pour the boiling water in the plate and then add 3 spoons of baking powder.
3. Immerse the silver tools which you want to clean in water, then leave the tools for 15 minutes.
4. Dry the tools after rinsing them with boiling water, then polish them with a piece of wool.



Glittering silver plate

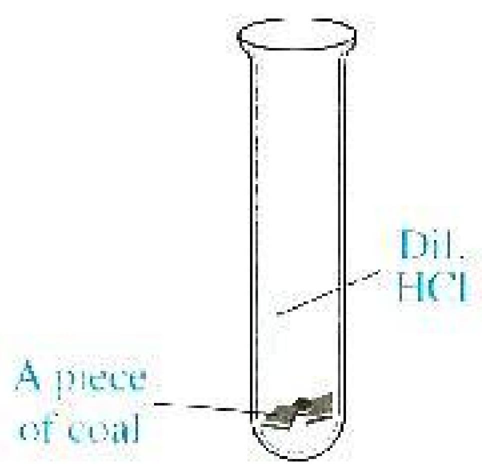
Chemical properties of nonmetals

* **To know the chemical properties of nonmetals, do the following activities :**

Activity 3 Reaction of nonmetals with dilute acids :

Substances and tools:

- A test tube.
- A piece of coal (carbon).
- Dilute hydrochloric acid (HCl).

Step	Illustrating figure	Observation
Put a piece of coal (carbon) in a test tube then add some dilute (HCl) to it.		No reaction takes place.

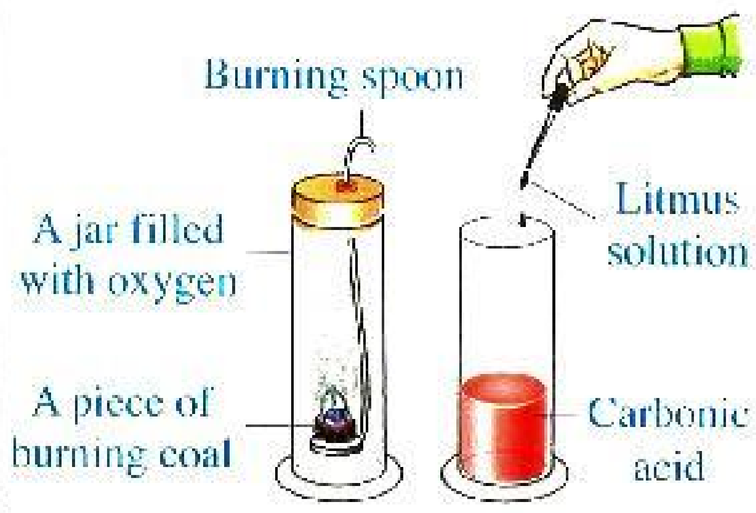
Conclusion:

Nonmetals (such as carbon) don't react with dilute acids (such as HCl).

Activity 4 Reaction of nonmetals with oxygen :

Substances and tools:

- A piece of coal (carbon).
- A burning spoon.
- A jar filled with oxygen.
- Water.
- Violet litmus solution.

Steps	Illustrating figures	Observations
1. Burn a piece of coal in a burning spoon and put it after complete burning in a jar filled with oxygen. 2. Add some water to the jar with shaking then add drops of violet litmus solution.	 Fig. (1) Fig. (2)	- The glow increases. - The produced substance from burning (carbon dioxide) dissolves in water and the solution turns into red.

Conclusion:

- Nonmetals such as carbon (C) react with oxygen forming ***nonmetal oxides,*** most of them are known as ***"Acidic oxides"***.

$$\text{Nonmetal} + \text{Oxygen} \xrightarrow{\text{heat}} \text{Acidic oxide}$$

$$\underset{\text{Carbon}}{C} + \underset{\text{Oxygen}}{O_2} \xrightarrow{\Delta} \underset{\text{Carbon dioxide}}{CO_2}$$

- Acidic oxides (such as carbon dioxide) dissolve in water forming ***acidic solutions*** which turn violet litmus solution into ***red***.

$$\text{Acidic oxide} + \text{Water} \longrightarrow \text{Acid}$$

$$\underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{H_2O} \longrightarrow \underset{\text{Carbonic acid}}{H_2CO_3}$$

Acidic oxides:

They are nonmetallic oxides, which dissolve in water forming acidic solutions.



Acidic solution turns litmus solution into red

G.R. ***Some oxides as aluminium oxide (Al_2O_3) are known as "Amphoteric oxides".***

Because they can react with acids as basic oxides and also react with bases as acidic oxides giving in the two cases salt and water.

Exercise

How can you differentiate between calcium oxide solution and sulphur trioxide solution.

Answer

By adding violet litmus solution :
- The calcium oxide solution turns into blue.
- The sulphur trioxide solution turns into red.



➲ Comparison between metals and nonmetals :

Metals	Nonmetals
- They are the elements, which have **less than four electrons** in their outermost energy levels.	- They are the elements, which have **more than four electrons** in their outermost energy levels.
- They tend to **lose** electrons and change into **positive** ions.	- They tend to **gain** electrons and change into **negative** ions.
- They are characterized by **largest** atomic sizes.	- They are characterized by **smallest** atomic sizes.
- Some of them **react** with dilute acids forming a salt of an acid and hydrogen gas.	- They **don't react** with dilute acids.
- They react with oxygen forming **basic oxides**.	- They react with oxygen forming **acidic oxides**.

➲ Comparison between basic oxides and acidic oxides :

Basic oxides	Acidic oxides
- They are **metal** oxides.	- They are **nonmetal** oxides.
- They are formed by the reaction of **metal** with oxygen.	- They are formed by the reaction of **nonmetal** with oxygen.
- Some of them dissolve in water forming alkaline solutions.	- They dissolve in water forming acidic solutions.
- Their solutions turn violet litmus solution into **blue**.	- Their solutions turn violet litmus solution into **red**.
- Ex.: Na_2O & MgO	- Ex.: CO_2 & SO_2

TRY to answer worksheets **5 & 6** in the Notebook

Remember

Lesson Two

Atomic size :

- Atomic size is determined by knowing the atomic radius.
- In periods, by increasing the atomic number, the atomic size decreases.
- In groups, by increasing the atomic number, the atomic size increases.

Electronegativity :

It is the ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.

Polar compounds :

They are covalent compounds in which the difference in electronegativity between their elements is relatively high such as water molecule (H_2O) and ammonia molecule (NH_3).

Metals :

They are the elements, which have less than four electrons in their outermost energy levels.

Nonmetals :

They are the elements, which have more than four electrons in their outermost energy levels.

Metalloids :

They are the elements, which have the properties of both metals and nonmetals.

Basic oxides :

They are metallic oxides, some of them dissolve in water forming alkaline solutions.

Chemical activity series :

It is the arrangement of metals in a descending order according to the degree of their chemical activity.

Acidic oxides :

They are nonmetallic oxides, which dissolve in water forming acidic solutions.

Questions ? on lesson Two

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. The atomic size is determined by knowing the atomic radius of the atom and its measuring unit is ....
   a. metre. b. millimetre. c. nanometre. d. picometre.

2. In period (2), the atomic size of oxygen ($_8O$) is greater than that of ....
   a. $_6C$ b. $_9F$ c. $_3Li$ d. $_5B$

3. In the same period, by increasing the atomic number, the ....
   a. atomic size decreases. b. atomic size increases.
   c. atomic radius increases. d. atomic size doesn't change.

4. Which of the following elements is a metallic element ? ....
   a. $_{12}Mg$ b. $_{17}Cl$ c. $_8O$ d. $_{10}Ne$

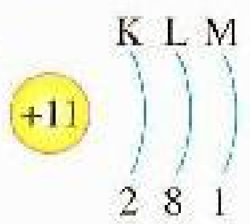
5. During the chemical reactions, metal atoms tend to ....
   a. lose electrons and change into negative ions.
   b. gain electrons and change into negative ions.
   c. lose electrons and change into positive ions.
   d. gain electrons and change into positive ions.

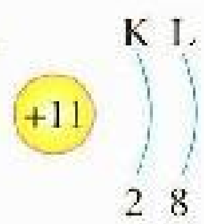
6. An element (X), whose atomic number is 13 so, the number of electrons in its ion is ....
   a. 8 b. 10 c. 11 d. 12

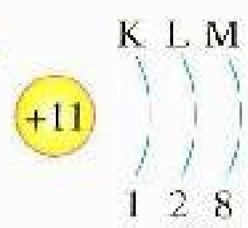
7. The electronic configuration of sodium ion (Na^+) is similar to that of ....
   a. $_7N$ b. $_{18}Ar$ c. $_{10}Ne$ d. $_8O$

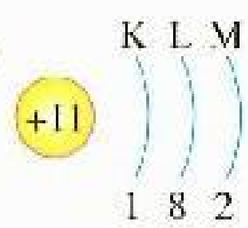
8. The electronic configuration of magnesium ion (Mg^{+2}) is similar to all the following except ....
   a. Na^+ b. $_{10}Ne$ c. Al^{+3} d. $_{18}Ar$

9. If you know that the atomic number of an element = 11, which of the following figures represents the electronic configuration of its ion ? ....

   a.


   b.


   c.


   d.


10. The difference between chlorine ($_{17}Cl$) atom and chloride ion (Cl^-) is the number of ....
    a. energy levels. b. protons. c. neutrons. d. electrons.

11. 📖 All of the following elements are from semi-metals except ....
    a. tellurium. b. silicon. c. boron. d. bromine.

12. Each period in the modern periodic table starts with ....
    a. metallic element.
    b. semi-metallic element.
    c. nonmetallic element.
    d. inert gas.

13. By increasing the atomic number within the period, all the following properties take place except ....
    a. metallic property decreases.
    b. nonmetallic property increases.
    c. atomic size decreases.
    d. atomic size increases.

14. By increasing the atomic number within the group (1A), all the following properties take place except ....
    a. atomic size decreases.
    b. nonmetallic property decreases.
    c. metallic property increases.
    d. atomic size increases.

15. .... is the lowest element in the metallic property in group (1A).
    a. Na b. Cs c. K d. Li

16. Sodium oxide is from .... oxides.
    a. acidic b. basic c. amphoteric d. nonmetal

17. Magnesium reacts with oxygen giving ....
    a. $Mg(OH)_2$ b. $MgCl_2$ c. MgO d. Mg_2O

18. All of the following metals react with water except ....
    a. K b. Cu c. Na d. Mg

19. When sodium reacts with water, ... gas evolves.
    a. N_2 b. O_2 c. H_2 d. CO_2

20. Which of the following elements reacts with dilute hydrochloric acid ? ....
    a. C b. Cl_2 c. S d. Zn

21. Which of the following is an acidic oxide ? ....
    a. MgO b. CO_2 c. FeO d. CuO

22. The oxides of the 3^{rd} period elements are as the following ....
    a. acidic, amphoteric, then basic.
    b. acidic , basic , then amphoteric.
    c. basic , acidic , then amphoteric.
    d. basic , amphoteric , then acidic.

23. Burning of carbon in air produces ....
    a. CO b. CO_2 c. H_2CO_3 d. CuO

24. The oxide which dissolves in water and produces an acid is ....
    a. MgO b. FeO c. CuO d. CO_2

2. Put (✓) or (×) and correct the wrong ones :

1. The atomic size increases in the same group by increasing the atomic number. ( )
2. The atomic size of chlorine ($_{17}Cl$) is greater than that of magnesium ($_{12}Mg$). ( )
3. The atomic size decreases in periods as the atomic number increases. ( )
4. The chemical bond is described as a polar covalent bond, when the difference in electronegativity between the two bonded elements is equal to zero. ( )

5. Water and ammonia are from polar compounds. ( )
6. Water molecule is a polar compound because the difference in electronegativity between its elements is relatively low. ( )
7. The electronic structure of the positive ion is similar to that of the nearest following inert gas. ( )
8. Both oxygen ion (O^{-2}) and argon atom (Ar) have the same electronic configuration. ( )
9. During the chemical reaction, ($_{12}Mg$) atom tends to form positive ion that carries one positive charge. ( )
10. Each period starts with a weak metal. ( )
11. Metalloids have the properties of metals and nonmetals. ( )
12. By increasing the atomic number within a period, the metallic property increases. ( )
13. The metallic property in group (1A) increases as we go from up to down. ( )
14. Magnesium reacts with dilute (HCl) and (Cl_2) gas evolves. ( )
15. Magnesium oxide is a basic oxide. ( )
16. Metals are arranged in an ascending order according to the degree of their chemical activity in the chemical activity series. ( )
17. Sulphuric acid is produced when carbon dioxide gas dissolves in water. ( )
18. Iron is more chemically active than silver and less active than calcium. ( )
19. Copper and zinc don't react with water. ( )
20. Some basic oxides dissolve in water forming acidic solutions. ( )
21. Burning a piece of coal gives (CO) gas which is an acidic oxide. ( )
22. The solutions produced from dissolving of nonmetal oxides in water turn the violet litmus solution into red. ( )
23. Some alkalis dissolve in water forming bases. ( )

3. Write the scientific term of each of the following :

1. • A part of million of the million part of a metre.
   • The measuring unit of atomic radius which is used as a measure for the atomic size.
2. The ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.
3. Covalent compounds, in which the difference in electronegativity between their elements is relatively high.
4. The polar compound, which consists of one oxygen atom and two hydrogen atoms.
5. • A kind of elements in which their valency shells contain less than 4 electrons.
   • Elements whose atoms tend to lose electrons during chemical reactions and change into positive ions.

6. An atom of a metallic element, which loses one electron or more during the chemical reaction.
7. • A kind of elements, in which their valency shells contain more than 4 electrons.
   • Elements whose atoms tend to gain electrons during chemical reactions and change into negative ions.
8. An atom of a nonmetallic element, which gains one electron or more during the chemical reaction.
9. The inert gas which has the same electronic structure of sodium ion (Na^+).
10. Elements which have the properties of metals and nonmetals.
11. A group contains the strongest nonmetals.
12. A solution used to differentiate between acids and bases.
13. Oxides which dissolve in water forming alkaline solutions.
14. • Substances which turn the litmus solution into blue.
    • Substances resulted from dissolving of metal oxides in water.
15. A kind of metal oxides reacts with acids as basic oxides and also reacts with bases as acidic oxides.
16. The arrangement of metals in a descending order according to the degree of their chemical activity.
17. • Substances which turn the litmus solution into red.
    • Substances resulted from dissolving of nonmetal oxides in water.
18. The nonmetal oxides which dissolve in water forming acidic solutions.

4. Complete the following statements :

1. The atomic size is determined by knowing the .... and its measuring unit is ....
2. By increasing the atomic number, the values of atomic sizes .... in the same period of the periodic table.
3. By increasing the atomic number in the same group, the atomic size .... due to the increase of the number of ....
4. The atomic size of lithium ($_3Li$) atom is .... than that of nitrogen ($_7N$) atom and .... than that of sodium ($_{11}Na$) atom.
5. .... is the ability of the atom in a covalent molecule to attract the .... of the chemical bond towards itself.
6. .... and .... are examples of polar compounds.
7. The polarity of water is .... than that of ammonia as the difference in .... between elements of water is .... than that between elements of ammonia.
8. Elements are classified into four main kinds which are metals, nonmetals, ... and ....
9. The outermost energy level of metallic elements contains .... than four electrons, while that of nonmetallic elements contains .... than four electrons.

10. During the chemical reaction, nonmetal atom tends to .... electrons and changes into ....
11. During the chemical reaction, magnesium ($_{12}Mg$) atom loses .... electrons and changes into .... ion, which carries .... positive charges.
12. The .... ion carries a number of .... equals to the number of lost electrons.
13. The number of .... charges of the negative ion is equal to the number of gained ....
14. .... have the properties of both metals and nonmetals.
15. By increasing the atomic number within a period, the metallic property ...., while the nonmetallic property ....
16. Each period in the modern periodic table starts with .... except the first period, and ends with ....
17. The most metallic element in group (1A) is ....
18. By increasing the atomic number within group (1A), the metallic property ....
19. Some metals react with dilute acids giving .... and .... gas evolves.
20. Some basic oxides dissolve in water forming ...., which turn the litmus solution into ....
21. Metals are arranged in a .... order according to the degree of their .... in chemical activity series.
22. .... metal reacts with hot water vapour, while .... metal doesn't react with water.
23. .... is an example of nonmetals which doesn't react with dilute acids.
24. Metal oxides are called .... oxides, while nonmetal oxides are called .... oxides.
25. Nonmetal oxides dissolve in water forming ...., which turn the litmus solution into ....

5. Complete the following chemical equations :

1. $2Mg + O_2 \xrightarrow{\Delta}$ ....
2. .... + ... $\longrightarrow Mg(OH)_2$
3. $Mg + 2HCl \xrightarrow{dil.}$ .... + ...
4. $C + O_2 \xrightarrow{\Delta}$ ....
5. .... + ... $\longrightarrow H_2CO_3$

6. Complete the following table :

Element	Its electronic configuration	Its kind	Formula of its oxide	Type of its oxide
1. $_{11}Na$		Metal	Na_2O	....
2. $_{12}Mg$				....
3. $_{6}C$		Nonmetal		....

7. Give a reason for each of the following :

1. The atomic size decreases in the same period by increasing the atomic number.
2. The atomic size increases by increasing the atomic number within the same group.
3. Water molecule is from the polar covalent molecules.
4. Water is more polar than ammonia.
5. Ammonia (NH_3) is considered as a polar covalent compound.
6. During the chemical reactions, sodium ($_{11}Na$) atom tends to form a positive ion.
7. During the chemical reaction, chlorine ($_{17}Cl$) atom tends to form a negative ion.
8. Both sodium ion (Na^+) and fluoride ion (F^-) have the same electronic configuration.
9. The metallic property for elements of group (1A) increases by increasing the atomic number.
10. Cesium (Cs) is considered as one of the strongest metallic elements.
11. Solution of magnesium oxide turns the violet litmus solution into blue.
12. Potassium reacts instantly with water, while copper doesn't react with water.
13. Solution of carbon dioxide turns the violet litmus solution into red.
14. Aluminium oxide is considered as an amphoteric oxide.

8. What is meant by ... ?

1. Electronegativity.
2. Polar compounds.
3. Metals.
4. Nonmetals.
5. Positive ion.
6. Negative ion.
7. Metalloids.
8. Chemical activity series.
9. Basic oxides.
10. Acidic oxides.

9. Write the balanced chemical equations, which express the following reactions :

1. Magnesium with dilute hydrochloric acid.
2. Burning a magnesium strip in oxygen.
3. Dissolving of magnesium oxide in water.
4. Burning a piece of coal in air.
5. Carbon dioxide with water.

10. Arrange the following elements :

1. $_{11}Na$ / $_{19}K$ / $_{13}Al$ / $_{12}Mg$ (ascendingly according to the atomic size).
2. $_{19}K$ / $_{3}Li$ / $_{55}Cs$ / $_{11}Na$ (ascendingly according to the metallic property).
3. Cu / Zn / Mg / K (ascendingly according to the chemical activity).

11. How can you differentiate chemically between each of the following ? [Write the chemical equation if it is possible].

1. Sodium and iron [using (H_2O)].
2. Magnesium oxide and sulphur oxide.

12. Choose the odd word (or symbol) out, then write the scientific term of others :

1. Al^{+3} / Na^{+} / Mg^{+2} / Cl^{-} / O^{-2}
2. Silicon / Boron / Arsenic / Bromine.
3. Silver / Sodium / Iron / Calcium.
4. CO_2 / MgO / Na_2O / CaO

13. What happens when ... ?

1. Increasing the atomic number in group (1A) [concerning the atomic size].
2. A metallic atom loses one electron or more during the chemical reaction.
3. A nonmetallic atom gains one electron or more during the chemical reaction.
4. We go from up to down in group (1A).
5. Adding dilute (HCl) to a piece of magnesium.
6. Burning a magnesium strip inside a test tube contains oxygen.
7. Adding some water to magnesium oxide with shaking.
8. Burning a piece of coal inside a test tube contains oxygen.
9. Adding the violet litmus solution to magnesium hydroxide.
10. Adding the violet litmus solution to a jar containing a piece of burning coal.
11. Passing carbon dioxide gas in water.

14. Compare between each of the following :

1. Period elements and group elements.
2. Positive ion and negative ion.
3. Basic oxides and acidic oxides.
4. Metals and nonmetals.
5. Sodium and silver (related to : the reaction with water).
6. Magnesium oxide and carbon dioxide (related to : type of oxide - the reaction with water).

15. Explain the behaviour of the following elements with water :

1. Iron. 2. Silver. 3. Potassium.

16. Mention the type of mathematical relation (direct or inverse) between each of the following with drawing as possible.

1. The atomic size and atomic number of the elements of the same period.
2. The atomic size and atomic number of the elements of the same group.
3. Metallic property and atomic number of elements of group (1A).
4. Metallic property and atomic size of elements of group (1A).

17. Variant questions :

(1) $2Mg + O_2 \xrightarrow{\Delta} (A)$ $\qquad$ $(A) + H_2O \longrightarrow (B)$

1. Write the name and the chemical formula of (A) and (B).
2. What is the effect of adding litmus solution to the compound (B) ?
3. What is the type of the compound (A) ?

(2) Three elements ($_{11}X$) , ($_6Y$) and ($_{12}Z$) , which of these elements :

1. Reacts instantly with water and hydrogen gas evolves which burns with a pop sound ?
2. Reacts very slowly with cold water ?
3. Whose oxide consists of two atoms only ?

(3) Three elements ($_3X$) , ($_9Y$) and ($_{11}Z$) , which of these elements :

1. Has the smallest atomic size ?
2. Has the strongest metallic property ?

(4) Sodium ($_{11}Na$), aluminium ($_{13}Al$) and carbon ($_6C$) are three elements from the periodic table, mention :

1. The period of each of these elements.
2. The number of group of each element.
3. The type of oxide of each element.
4. The type of solution which is formed as a result of adding water to :

   a. Sodium oxide. $\qquad$ b. Carbon dioxide.

(5) If you have the following materials [Water (H_2O) – Magnesium (Mg) – Hydrochloric acid (HCl) – Magnesium oxide (MgO)].

By chemical equations only, show how can you get :

1. An alkaline solution.
2. A metal chloride.

(6) How can you clean the silver tools by a chemical way ?

18. Study the following figures, then answer the questions :

(1) Look at the following figures, then answer :

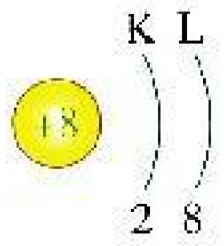


Fig. (A)

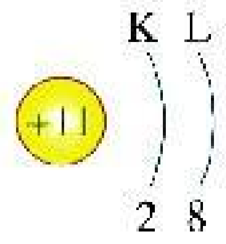


Fig. (B)

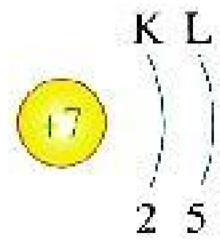


Fig. (C)

Which one of the figures represents ... ?

1. A neutral atom. 2. A positive ion. 3. A negative ion.

(2) The opposite figure represents a part of the periodic table.

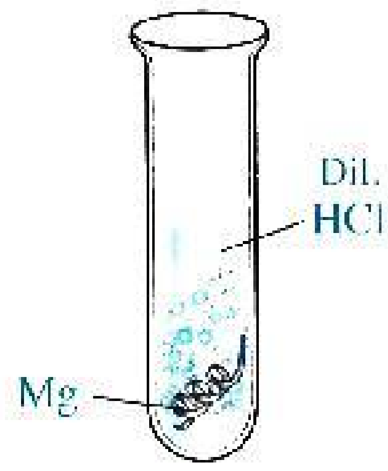
Answer the following :

1. Which element has the greatest atomic size ?
2. Which element has the lowest atomic size ?

$_3Li$	$_4Be$	$_5B$	$_6C$	$_7N$	$_8O$
$_{11}Na$					
$_{19}K$					

(3) On adding a dilute hydrochloric acid to a magnesium ribbon (as shown in the figure), a gas is evolved :

1. Name the gas, how can you identify it?
2. Write the balanced symbolic equation which expresses this reaction.



(4) Which of the following figures represents the graduation of the atomic size property in period (3) ?

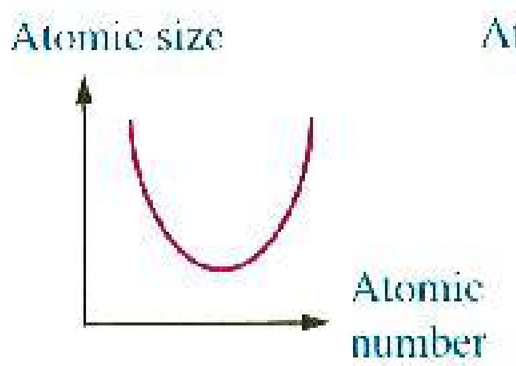


Fig.(A)

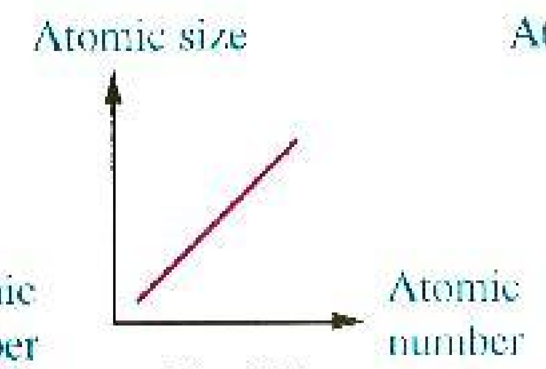


Fig.(B)

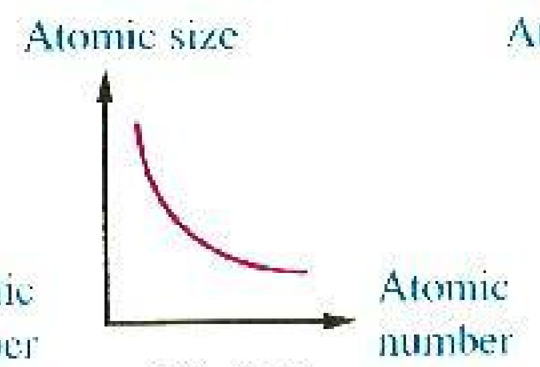


Fig.(C)

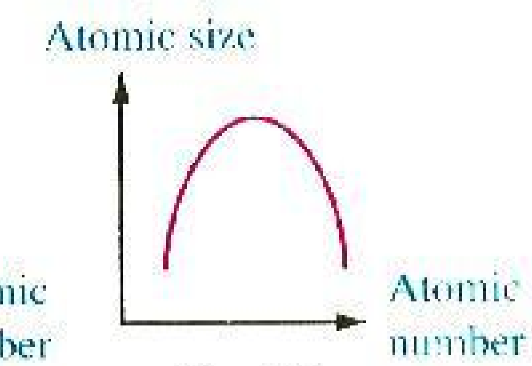


Fig.(D)

Thinking Skills Questions

1. Choose the correct answer :

1. Three elements (X, Y, Z) lie in the same period in the periodic table, if oxide of element (X) reacts with acids and bases, oxide of element (Y) reacts with bases only and oxide of element (Z) reacts with acids only.

   What is the correct order of atomic numbers of these elements ?

   a. X < Z < Y b. Y < X < Z c. Y < Z < X d. Z < X < Y

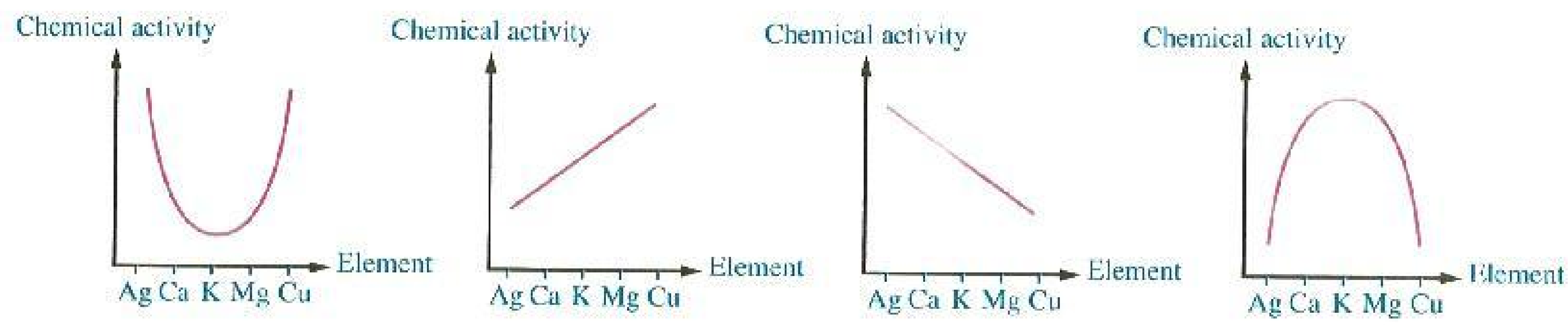
2. The number of electrons present in the ion of trivalent metallic element, whose electrons orbit in three energy levels is ....

   a. 3 b. 8 c. 10 d. 13

3. The nucleus of (X^{-2}) ion is surrounded by 18 electrons revolve around it, and the mass number of this ion equals 32, so the number of electrons in the (X) atom is .... and the number of its neutrons is ....

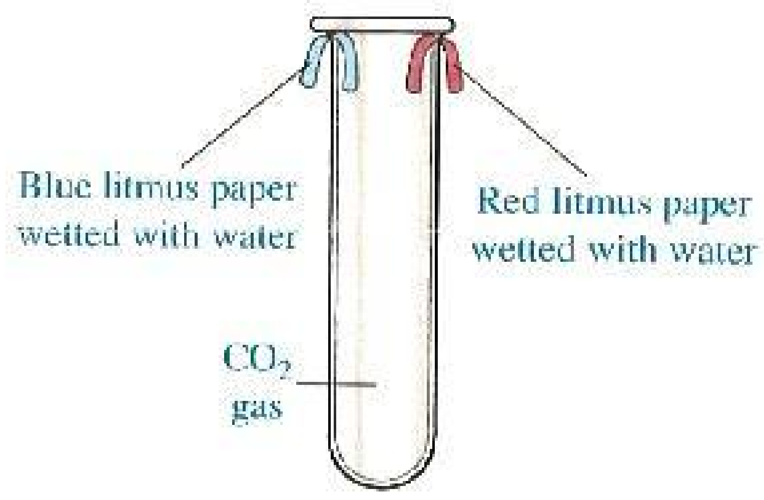
   a. 16 , 23 b. 18 , 23 c. 18 , 32 d. 16 , 16

4. Graph .... represents the degree of the chemical activity of some elements with water.



a. b. c. d.

2. In the opposite figure :



a. What happens in this case for the two different litmus papers ? (**Give a reason**).

b. Write the chemical equation of the reaction.

Lesson 3

Main Groups in the Modern Periodic Table



What are the properties of some main groups in the modern periodic table?

Do you know that some of the main groups in the periodic table are characterized by specific names due to their properties such as :

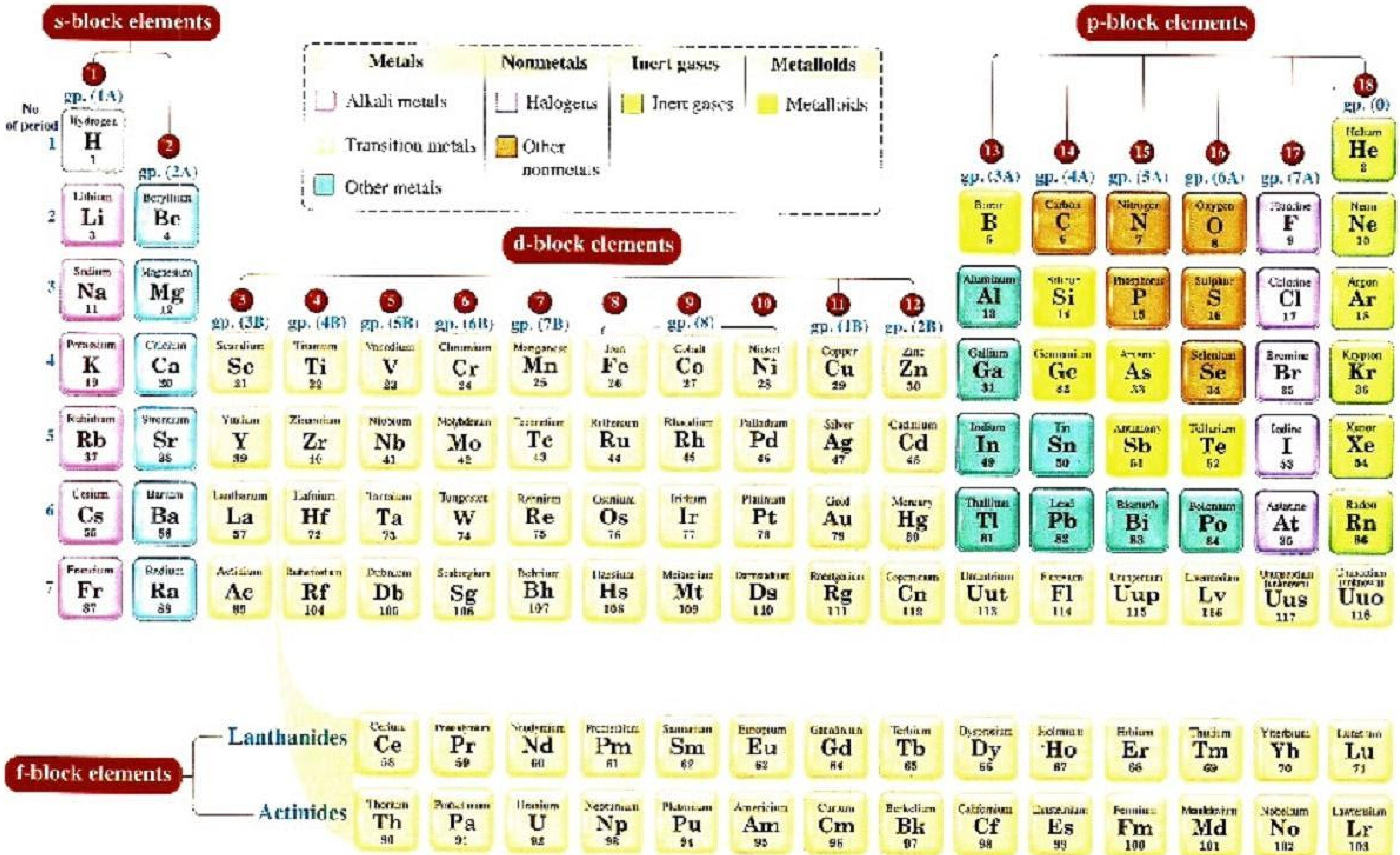
- *Alkali metals.*
- *Halogens.*
- *Inert gases.*



* In this lesson, we are going to study three of the main groups in the modern periodic table, which are :

The name of the group	Alkali metals	Halogens	Inert gases
Traditional number :	1 A	7 A	0
Modern number :	1	17	18

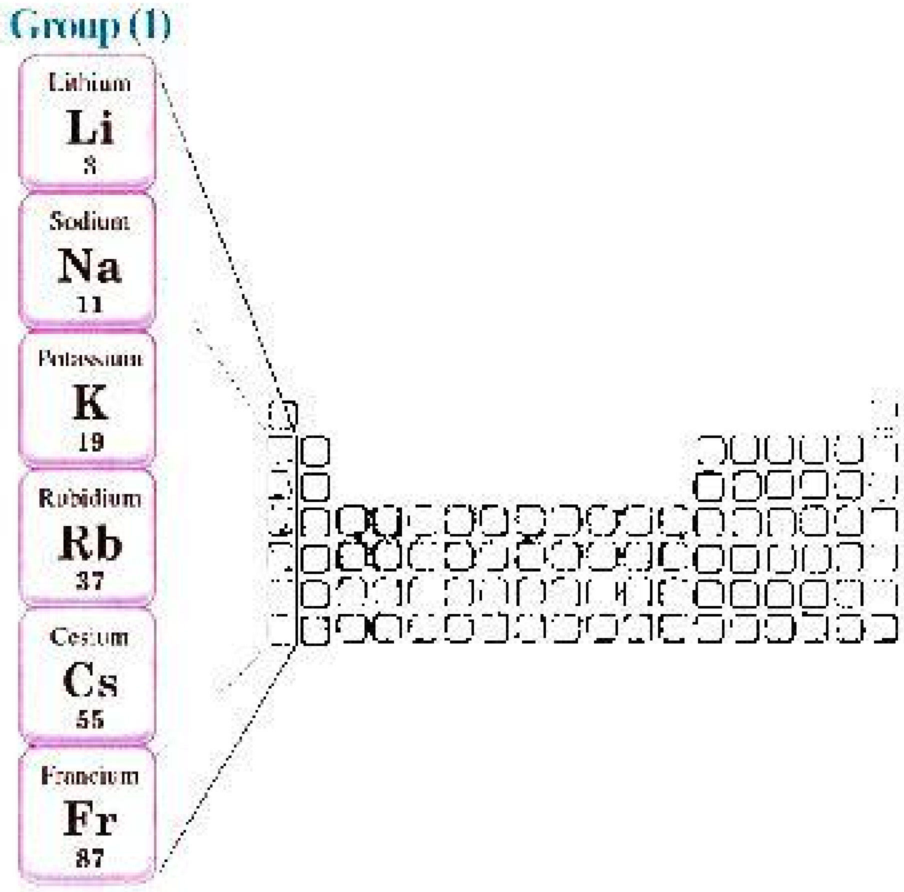
Elements of the Modern Periodic Table



1 Alkali metals group [group 1A]

* Location :

- It is located on the maximum left side of the modern periodic table (as shown in the opposite figure).
- It is the first group of **s-block**.



Alkali metals

▶ Enrichment information

Although hydrogen gas exists in group (1A), it is a nonmetal because its atom is remarkably small and it is a gaseous element.

* General properties of alkali metals :

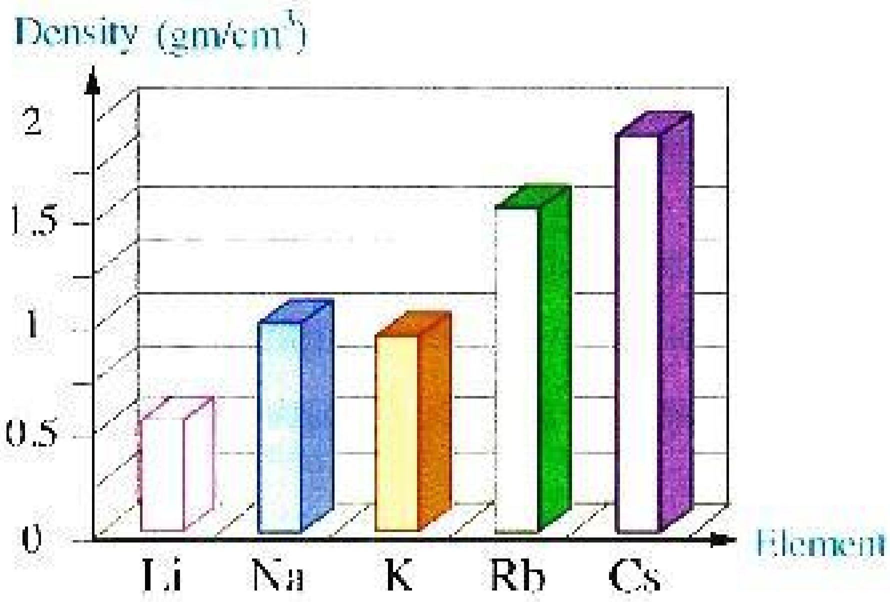
A Physical properties

1. They are **good** conductors of heat and electricity.
2. All of them are **solids** at ordinary temperature and they have **metallic lustre**.
3. Most of them have **low density**.

? Exercise

Study the opposite figure which represents the density of alkali metals, then determine :

1. The alkali metal which has the lowest density and which one has the highest density.
2. The elements that float on water and those that sink in water, with explanation.

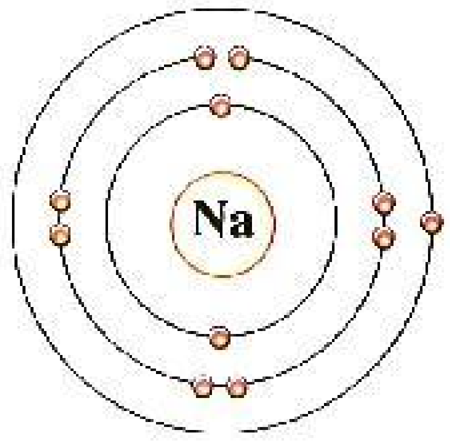


Answer

1. - The **lowest** density alkali metal : Lithium (Li) element.
   - The **highest** density alkali metal : Cesium (Cs) element.
2. - Alkali elements that **float** on water surface : Lithium (Li), Sodium (Na), Potassium (K).
   Explanation : Because their densities are smaller than the density of water (1 gm/cm^3).
   - Alkali elements that **sink** in water : Rubidium (Rb), Cesium (Cs).
   Explanation : Because their densities are greater than the density of water (1 gm/cm^3).

B Chemical properties

1 Their outermost energy level contains only one electron.



Sodium is monovalent metal

2 **They are monovalent elements G.R.**

Because they tend to lose their valency (outermost) electron during the chemical reaction forming positive ions, each of them carries one positive charge.

M	$\longrightarrow$	M^{+}	$+$	e^{-}
Alkali metal		Positive ion		Electron

3 **They are chemically active elements so, they are kept under the surface of kerosene or paraffin oil G.R.**

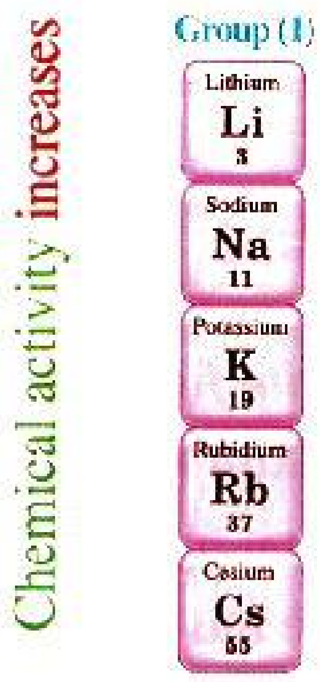
to prevent their reactions with moist air.



Alkali metals are kept under the surface of kerosene [except lithium which is kept under the surface of paraffin oil].

4 **Their chemical activity increases as the atomic number increases G.R.**

Due to the increase of their atomic sizes, so they can lose the valency electron easily.



G.R. ***Cesium (Cs) is the most active alkali metal in the periodic table.***

Because it has the largest atomic size, so it can lose its valency electron easily.

Enrichment information

Lithium is not kept under the surface of kerosene, because it floats on its surface and burns at once causing the burning of kerosene too, so it is kept in paraffin oil as lithium sinks in paraffin oil.

Activity **Reaction of alkali metals with water :**

Substances and tools:

- A very small piece of sodium.
- A very small piece of potassium.
- Two beakers containing water.
- Two filter paper.

Steps :

1. Wrap the two small pieces of sodium (pea size) and potassium with a filter paper.
2. Put each of them carefully in a beaker containing water.

Observations :

- Both sodium and potassium react strongly with water and hydrogen gas evolves which burns with a pop sound (by the effect of the heat produced from the reaction).
- The reaction of potassium with water is stronger than that of sodium.



Reaction of sodium with water



Reaction of potassium with water

Conclusion:

- Each of sodium and potassium reacts with water forming **alkaline solution** and **hydrogen gas** evolves.

$$\underset{\text{Sodium}}{2Na} + \underset{\text{Water}}{2H_2O} \longrightarrow \underset{\text{Sodium hydroxide}}{2NaOH} + \underset{\text{Hydrogen gas}}{H_2\uparrow}$$

$$\underset{\text{Potassium}}{2K} + \underset{\text{Water}}{2H_2O} \longrightarrow \underset{\text{Potassium hydroxide}}{2KOH} + \underset{\text{Hydrogen gas}}{H_2\uparrow}$$

- The reaction of potassium with water is stronger than that of sodium, because potassium is more active than sodium as its atomic size is larger than that of sodium.

G.R.

- ***Elements of group (1A) in the periodic table are called alkali metals (alkaline metals).***

  Because they react with water forming alkaline solutions.

- ***Sodium fires are not put off with water.***

  Because sodium reacts instantly with water and hydrogen gas evolves which burns with a pop sound by the effect of the heat produced from the reaction :

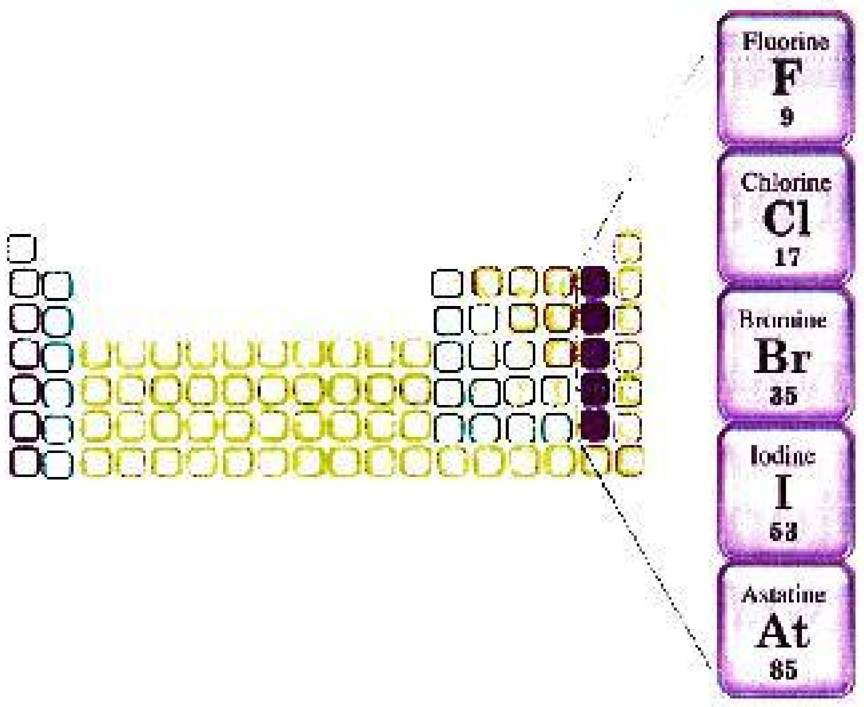
$$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$$

TRY to answer worksheet **7** in the Notebook

2 Halogens group [group 7A]

* Location :

- It is located on the right side of the modern periodic table before the inert gases.
- It is one of the groups of **p-block**.



Halogens elements

* General properties of halogens :

A Physical properties

1. They are **bad** conductors of heat and electricity.

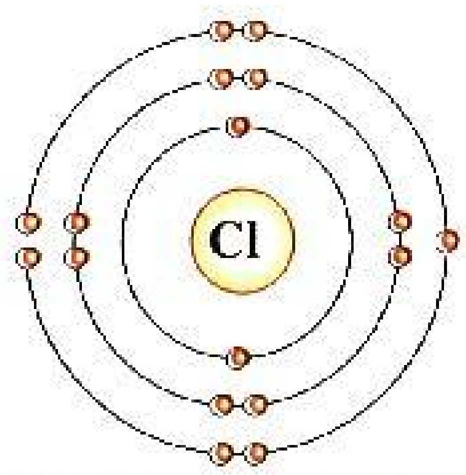
2. Their physical state is graduated from :

Gaseous state to Liquid state to Solid state



B Chemical properties

1. Their outermost energy level contains **7 electrons**.



Chlorine is monovalent nonmetal

2. They are monovalent elements G.R.

Because they tend to gain one electron only during the chemical reaction forming negative ions each of them carries one negative charge.

$$M + e^- \longrightarrow M^-$$

Nonmetal "halogen" Electron Negative ion

3. They are **chemically active** elements, therefore they do **not** exist individually in nature but they exist in **chemical compounds** [except Astatine (At) which is prepared artificially].

4. They exist in the form of **diatomic** molecules (formed of two atoms).

Element	Fluorine	Chlorine	Bromine	Iodine
Formula of molecule	F_2	Cl_2	Br_2	I_2

5. They react with **metals** forming **salts**, so they are called **halogens**, which mean **"Salts formations"**.

$$2K + Br_2 \longrightarrow 2KBr$$
Potassium + Bromine → Potassium bromide

$$2Na + Cl_2 \longrightarrow 2NaCl$$
Sodium + Chlorine → Sodium chloride

6. Each element from halogens **replaces** the elements **below** it in their salt solutions.

Examples :

$$Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$$
Chlorine + Potassium bromide → Potassium chloride + Bromine

$$Br_2 + 2KI \longrightarrow 2KBr + I_2$$
Bromine + Potassium iodide → Potassium bromide + Iodine

For illustration :

Although fluorine is the most active halogen, but it doesn't replace other halogens in their salt solutions because it reacts with water which the salt dissolved in.

Enrichment information

Chlorine is used in the manufacture of corrector, which is a very volatile liquid. On using it, it becomes dry quickly, leaving a white substance on the words and lines required to be deleted.

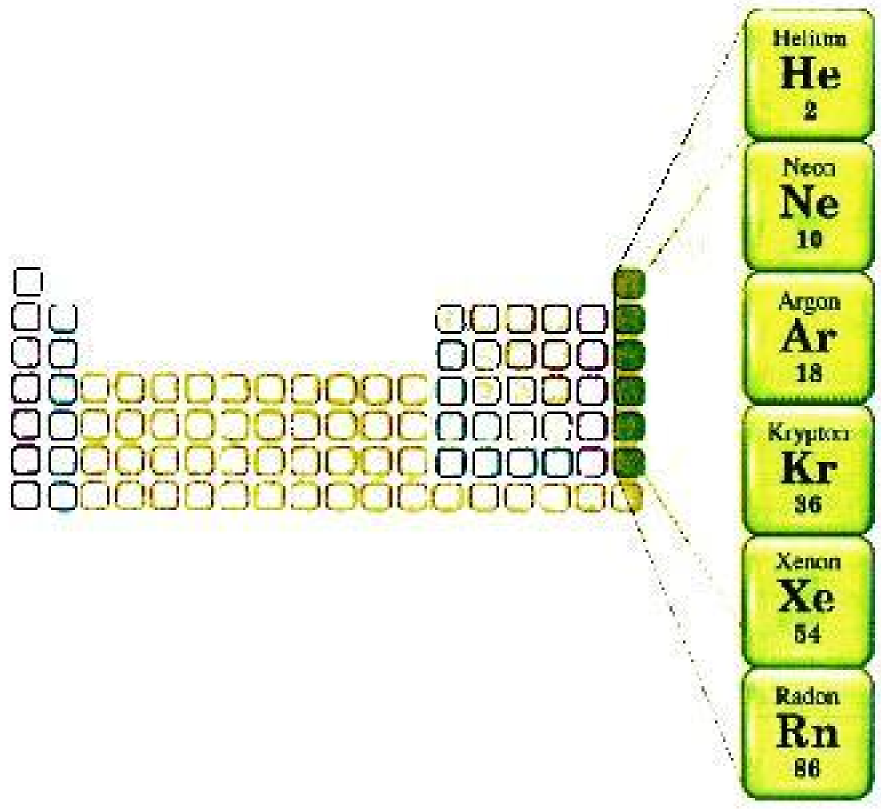


UNIT 1

3 Inert gases group [group 18]

* Location :

- It is located on the maximum right side of the modern periodic table.
- It is the last group in **p-block**.



Inert gases

* General properties of inert gases :

1. They are present in **gaseous** state.

2. Their outermost energy level contains **8 electrons**, except **Helium** which contains only 2 electrons [Helium has only (K) energy level].

3. Their valency equals zero G.R.

Because their outermost energy levels saturated with electrons.

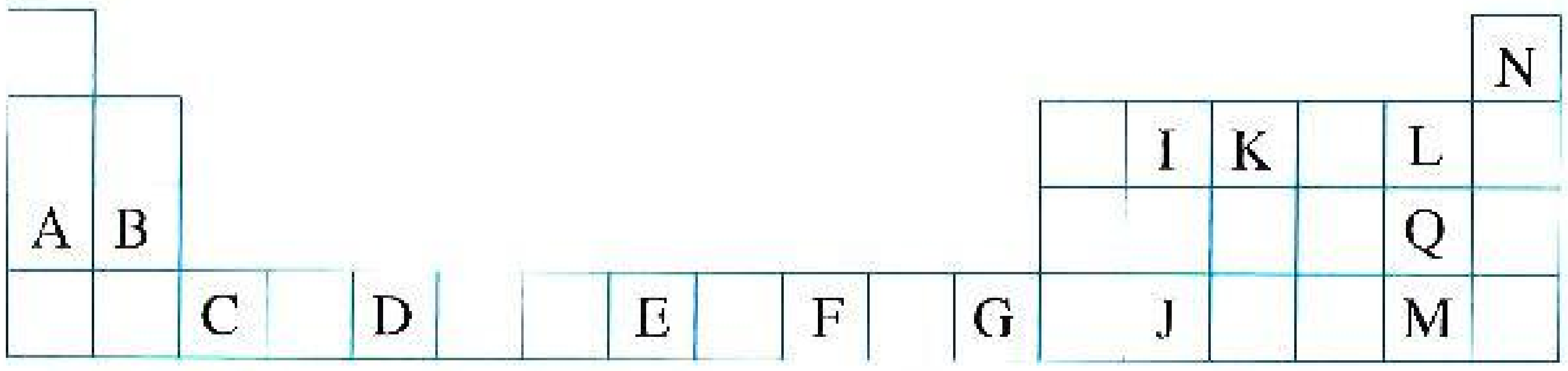
4. They are **chemically inactive** elements, **G.R.**

Because they don't react with other elements under normal conditions.

5. They exist in the form of **monoatomic** molecules (formed of one atom only).

Question

From the following figure which represents a section of the modern periodic table. Answer the following questions :



[NB. The letters in the table don't represent the actual symbols of elements]

1. What is the letter which indicates each of the following ? Mention the group number of each of them :

   a. An element is kept under the surface of kerosene in laboratory.

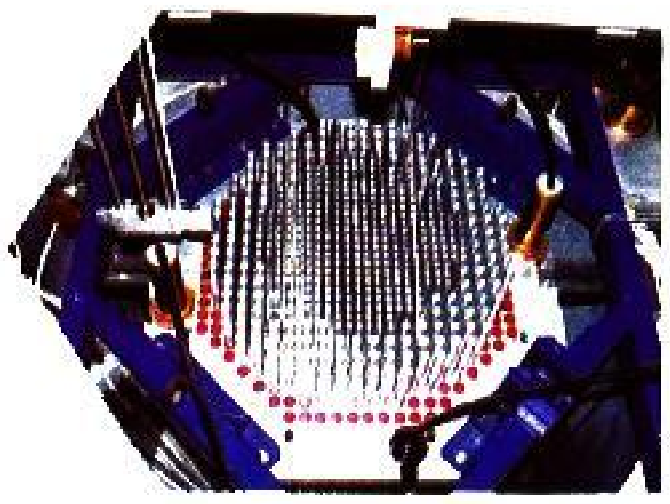
   b. An element doesn't react with another under normal conditions.

2. Does the element (Q) replace the element (L) or the element (M) in its salt solution ?

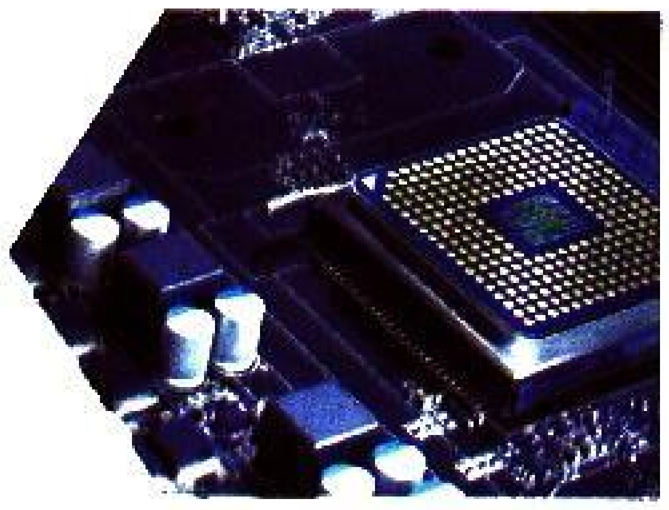
Properties of some elements and their uses

- Uses of elements or their compounds in the modern techniques depend on their properties and types.
- The following table shows the uses of some elements.

Element	Its uses
Sodium $^{23}_{11}Na$ **Sodium in a liquid state** [Metal]	**It is used in a liquid state in the nuclear reactor G.R.** Because it is a good conductor of heat that can transfer heat from inside the nuclear reactor to outside to be used to obtain the vapour energy required to generate electricity.
Cobalt $^{60}_{27}Co$ **Radioactive cobalt 60** [Transition element] 60 is the mass number of cobalt	**It is used in food preservation G.R.** Because it radiates (emits) gamma rays, which prevent the reproduction of microbial cells without an effect on human.
Silicon $^{28}_{14}Si$ **Silicon** [Metalloid]	**Silicon slides are used in the manufacture of electronic devices such as computer and transistor G.R.** Because it is a semi-conductor which its ability to conduct electricity depends on temperature.
Nitrogen $^{14}_{7}N$ **Liquefied nitrogen** [Nonmetal]	**It is used in the preservation of cornea of the eye G.R.** Due to the decrease in its boiling point (–196°C).


Core of nuclear reactor


Sterilization of meat by gamma rays


Electronic slide


Liquefied nitrogen

➲ Comparison between main groups in the modern periodic table :

P.O.C.	Alkali group	Halogens group	Inert gases group
Group number :	(1) 1A	(17) 7A	(18) 0
Block which it belongs to :	s-block	p-block	
Valency of its elements :	Monovalent		Zero

▸ Enrichment information

The Egyptian scientist Dr : Moustafa El-Sayed got the highest American medal in science for his efforts in the Nanotechnology on 29th September, 2008 and applying this technology in using gold in the treatment of cancer disease.



Dr : Moustafa El-Sayed

TRY to answer worksheets **8 & 9** in the Notebook

Remember

Lesson Three

From the main groups in the modern periodic table :

1. Alkali metals group (group 1A) :

- It is located on the maximum left side of the modern periodic table.

• Properties of alkali metals :

- They are good conductors of heat and electricity.
- Most of them have low density.
- All of them are solids at ordinary temperature and they have metallic lustre.
- They are monovalent as they tend to lose their valency electron during the chemical reaction.
- They are chemically active elements.

2. Halogens group (group 7A) :

- It is located on the right side of the modern periodic table before the inert gases.

• Properties of halogens :

- They are bad conductors of heat and electricity.
- They are monovalent elements as they tend to gain one electron during the chemical reaction.
- They exist in the form of diatomic molecules.
- They are chemically active elements.

3. Inert gases group (group 0)

- It is located on the maximum right side of the modern periodic table.

• Properties of inert gases :

- They are present in gaseous state in the form of monoatomic molecules.
- Their outermost energy level contains 8 electrons, except Helium which contains only 2 electrons.
- Their valency equals zero and they are chemically inactive.

Properties of some elements and their uses :

- Sodium is used in a liquid state in transferring heat from inside the nuclear reactor to outside.
- Cobalt 60 is used in food preservation.
- Silicon slides are used in the manufacture of electronic devices.
- Liquefied nitrogen is used in the preservation of cornea of the eye.

Questions ? on lesson Three

• Remember • Understand • Apply • Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. Alkali metals locate in group ....
   a. 7A b. 1A c. 1B d. 2A
2. Alkali metals are considered from .... block groups.
   a. s b. p c. d d. f
3. Which of the following elements is an alkali metal which locates in period three ? ....
   a. $_{3}Li$ b. $_{12}Mg$ c. $_{11}Na$ d. $_{19}K$
4. Elements of group (1A) react with water forming .... solutions.
   a. acidic b. alkaline c. neutral d. (a) and (c)
5. Hydrogen element belongs to ....
   a. group (1A). b. group (2A). c. group (6A). d. group (7A).
6. All these elements are monovalent except ....
   a. $_{11}Na$ b. $_{19}K$ c. $_{20}Ca$ d. $_{3}Li$
7. Sodium and potassium are kept under the surface of ....
   a. water. b. kerosene. c. alcohol. d. benzene.
8. The gas evolved on reacting alkali metal with water is ....
   a. oxygen. b. nitrogen. c. hydrogen. d. helium.
9. Most alkali metals have .... density.
   a. low b. high c. the same d. zero
10. All these alkali metals float on water surface except ....
    a. potassium. b. lithium. c. sodium. d. cesium.
11. .... form positive ions during chemical reactions.
    a. Nobel gases b. Nonmetals c. Halogens d. Alkali metals
12. All of the following are from the properties of alkali metals, except they ....
    a. have low densities. b. are divalent elements.
    c. conduct heat and electricity. d. are active elements.
13. Which of the following elements has the highest chemical activity ? ....
    a. Sodium. b. Lithium. c. Potassium. d. Cesium.
14. 📖 The strongest metal lies in group ....
    a. 7A b. 1B c. 1A d. 2A
15. Elements of group (7A) are known as ....
    a. inert gases. b. alkali metals. c. halogens. d. metalloids.

16. The outermost energy level of any halogen contains .... electrons.
   a. 2 b. 7 c. 8 d. 9
17. .... is considered from halogens.
   a. Sodium b. Chlorine c. Helium d. Calcium
18. Halogens are considered from .... block groups.
   a. s b. p c. d d. f
19. All these halogens exist in a gaseous state except ....
   a. fluorine. b. chlorine. c. iodine. d. (a) and (b).
20. The halogen which exists in a liquid state is ....
   a. bromine. b. chlorine. c. fluorine. d. iodine.
21. The molecule of halogen is composed of .... atom(s).
   a. one b. two c. three d. four
22. .... in its salt solutions.
   a. Chlorine replaces bromine b. Bromine replaces fluorine
   c. Iodine replaces chlorine d. Iodine replaces fluorine
23. The element(s) which can't replace bromine in its salt solution is (are) ....
   a. fluorine. b. iodine. c. chlorine. d. (a) and (c).
24. The halogen, which can be prepared artificially is ....
   a. chlorine. b. astatine. c. iodine. d. bromine.
25. Bromine can't be obtained when chlorine reacts with .... solution.
   a. sodium bromide b. potassium bromide c. sodium iodide d. (a) or (b)
26. Sodium in a liquid state is used in ....
   a. nuclear reactors. b. computers. c. fridges. d. sterilization.
27. The element which is used in the manufacture of transistor is ....
   a. S b. Si c. Na d. K
28. The element that emits gamma rays is ....
   a. ^{60}Co b. ^{23}Na c. ^{14}N d. ^{35}Cl
29. .... rays are used in preservation of food.
   a. Beta b. Alpha c. Gamma d. Laser
30. Cornea is preserved by using ....
   a. nitrogen gas. b. liquid paraffin.
   c. liquefied nitrogen. d. helium gas.
31. The boiling point of liquefied nitrogen is ....
   a. 0°C b. 196°C c. 100°C d. – 196°C

2. Put (✓) or (×) and correct what is wrong :

1. During chemical reactions, alkali metals form positive ions which carry two positive charges. ( )
2. Magnesium and potassium are kept under the surface of kerosene. ( )
3. Lithium is the most active metal in group (1A). ( )
4. Hydrogen gas evolves when sodium reacts with water. ( )
5. Potassium is more active than sodium in group (1A). ( )
6. The chemical activity of group (1A) elements increases as the atomic size increases. ( )
7. Alkali metals of group (1A) are good conductors of heat and electricity. ( )
8. Alkali metals are monovalent elements. ( )
9. Bromine exists in a liquid state, while iodine exists in a gaseous state. ( )
10. Chlorine can replace bromine in its salt solution. ( )
11. Potassium bromide is formed by the reaction of bromine with potassium chloride. ( )
12. Elements of group (18) are known as halogens. ( )
13. Halogens group is from s-block groups. ( )
14. Liquefied nitrogen is used in food preservation. ( )
15. Cobalt 60 emits gamma rays. ( )
16. Sodium is used in the preservation of cornea of the eye. ( )
17. Magnesium slides are used in the manufacture of electronic devices. ( )

3. Write the scientific term of each of the following :

1. • The group which is located on the maximum left side of the periodic table.
   • The first group of s-block groups in the periodic table.
2. • Elements of group (1A) in the modern periodic table.
   • Monovalent elements exist in s-block in the modern periodic table.
3. The kind of ions which are formed by alkali metals during chemical reactions.
4. The most active metal in the periodic table.
5. The group which is located on the right side of the periodic table before group zero.
6. • Elements of group (7A) in the periodic table.
   • Monovalent elements exist in p-block in the periodic table.
7. The halogen which exists in a solid state.
8. The halogen which exists in a liquid state.
9. The metal which is used in a liquid state in transferring heat from inside the nuclear reactor to outside.
10. The radioactive element, which is used in food preservation.
11. The metalloid which is used in the manufacture of electronic devices.
12. The nonmetal which is used in preservation of cornea of the eye.

4. Complete the following statements :

1. Elements of group (1A) are named as .... and they are among ....block elements.
2. Alkali metals group is located on .... of the modern periodic table.
3. .... and .... elements are among alkali metals.
4. Elements of group (1A) are called alkali metals as their elements react with .... forming .... solutions.
5. The valency of alkali metal elements is ....
6. During chemical reaction, an alkali metal loses its .... electron and changes into .... ion which carries .... positive charge.
7. Alkali metals are .... metals therefore, they are kept under the surface of .... or ....
8. Sodium is kept under the surface of .... to prevent it from the reaction with ....
9. The chemical activity of alkali metals increases as the .... and .... increase.
10. .... is the most active metal as it has the largest ....
11. .... is the alkali metal element, which is located in period three of the periodic table.
12. All alkali metals are good conductors of .... and ....
13. Lithium and sodium .... on the surface of water as their densities are .... than water density.
14. Rubidium and cesium .... in water as their densities are .... than water density.
15. Sodium reacts with water giving .... and .... gas evolves.
16. The reaction of potassium with water is .... than the reaction of sodium with water as potassium is .... active than sodium.
17. Elements of group (7A) are called ....
18. Halogens are among .... block groups and they are located on the .... side of the periodic table before .... gases.
19. The valency of the elements of group (7A) is .... , as they tend to .... one electron during the chemical reaction and change into .... ions.
20. The outermost energy level (valency shell) of alkali metals contains .... electron(s), while that of halogens contains .... electron(s).
21. Fluorine and chlorine exist in a .... state, while iodine exists in a .... state.
22. Halogen molecules are .... molecules as their molecules consist of .... atoms.
23. Chlorine can replace .... and .... in their salt solutions.
24. Bromine reacts with potassium iodide giving .... and..........
25. .... is used in food preservation, because it emits .... rays which prevent reproduction of microbial cells.

5. Complete the following chemical equations :

1. $2Na + ... \longrightarrow 2NaOH + H_2\uparrow$
2. $2K + 2H_2O \longrightarrow .... + ...$
3. $.......... + Br_2 \longrightarrow 2KBr$
4. $2Na + Cl_2 \longrightarrow ....$
5. $2NaBr + Cl_2 \longrightarrow .... + ...$
6. $Br_2 + ... \longrightarrow 2KBr + I_2$
7. $Cl_2 + 2KBr \longrightarrow .... + ...$

6. Complete the following table :

Element	Symbol	Type	Use
1.	N		Its liquid state is used in preservation of cornea of the eye.
2. Silicon			....
3.	Co		....
4. Sodium			....

7. Give a reason for each of the following :

1. Elements of group (1A) are known as alkali metals.
2. Sodium is kept under the surface of kerosene.
3. Lithium is the lowest active metal in group (1A).
4. Lithium floats on water surface, while cesium sinks in it.
5. The reaction of potassium with water is more strongly than the reaction of sodium with water.
6. Sodium fires aren't put off with water.
7. Cesium is the most active alkali metal in the periodic table.
8. Alkali metals are monovalent elements.
9. Elements of group (7A) are known as halogens.
10. Halogens do not exist in nature in an individual state.
11. Bromine can't replace chlorine in its salt solution.
12. Both alkali metals and halogens are monovalent elements.
13. The liquid sodium is used in nuclear reactors.

14. The use of radioactive cobalt 60 in food preservation.
15. Silicon slides are used in the manufacture of electronic devices.
16. Liquefied nitrogen is used in the preservation of cornea of the eye.

8. Write the balanced chemical equations that illustrate the following reactions :

1. Reaction of sodium with water.
2. Reaction of potassium with water.
3. Reaction of sodium with chlorine.
4. Reaction of potassium with bromine.
5. Effect of bromine on sodium iodide solution.
6. Reaction of chlorine gas with potassium bromide solution.
7. Passing chlorine gas in potassium iodide solution.
8. Reaction of chlorine with sodium bromide solution.

9. Mention one use of each of the following elements in modern techniques :

1. Liquid sodium.
2. Cobalt 60
3. Liquefied nitrogen.
4. Silicon.

10. Choose the odd word (or symbol) and write the scientific term of the rest :

1. Lithium / Sodium / Potassium / Helium.
2. Cl_2 / Br_2 / O_2 / I_2
3. Helium / Neon / Chlorine / Argon.

11. Compare between :

1. Alkali metals group and halogens group.
2. Chlorine and bromine [according to : the physical state and chemical activity].
3. Fluorine and helium.

12. Variant questions :

(1) Arrange the following elements :

1. Ascendingly according to the degree of chemical activity :
   Sodium / Rubidium / Lithium / Cesium
2. Ascendingly according to the density :
   Na / K / Li / Rb / Cs

(2) How can you use water to obtain a gas burns with a pop sound ?

Explain your answer with a balanced chemical equation.

(3) Mention the general properties of alkali metals.

(4) What is meant by ... ?

1. Alkali metals. 2. Halogens.

(5) You have three elements X , Y and Z, their atomic numbers are 10, 17 and 3 respectively.

Which of these elements belongs to :

1. Inert gases group. 2. Alkali metals group. 3. Halogens group.

(6) Which of the following three elements : $(_{11}X)$, $(_{17}Y)$, $(_{14}Z)$.

1. Can replace iodine in potassium iodide solution.
2. Reacts with water strongly with releasing heat.
3. Enters in formation of a compound which its solution turns violet litmus solution into blue.
4. Enters in the manufacture of electronic slides.
5. Form a salt when reacting together. **(Choose two elements).**

(7) The following table shows the properties of three elements (X , Y and Z)

Element symbol	Behaviour with water	Physical state	Electric conductivity	Density (gm/cm^3)
X	dissolve	gas	bad conductor	0.003
Y	react	solid	good conductor	3.59
Z	react instantly	solid	good conductor	0.86

[NB : The letters in the table don't represent the actual symbols of elements]

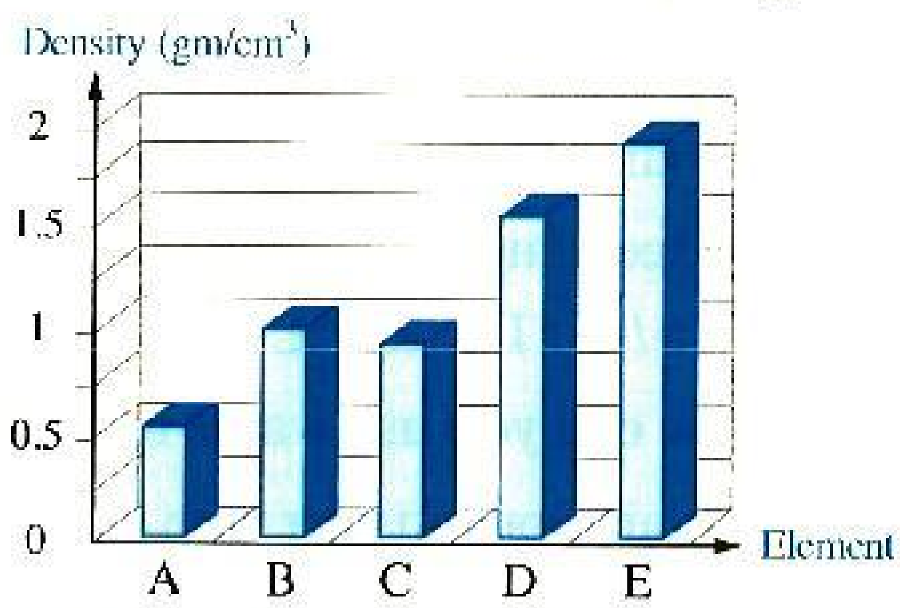
Mention the symbol, which represents an element from :

1. Alkali metals. 2. Halogens.

13. Study the following figures, then answer the questions :

(1) The opposite figure represents the density of elements of one of the two groups of s-block :

1. What is the name and the group number represented by the figure ?
2. What is the name and the symbol of each of the two elements A & D ?
   Which of them sinks in water ?
   Giving reason.



[NB. The letters in the graph don't represent the actual symbols of elements]

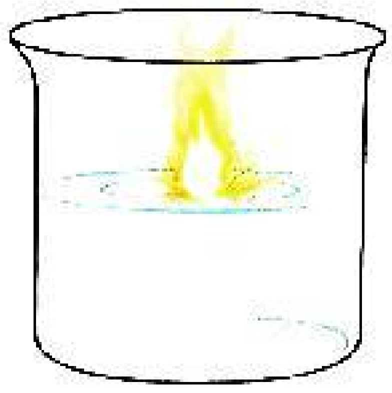
(2) The opposite figure represents one of the groups of the modern periodic table :

1. What is the name of this group ?
   What is the valency of their elements ?
2. What is the importance of element (Y) in the nuclear reactor ?
3. Calculate the atomic number of element (Z).
4. **Mention the symbol which indicates :**
   (a) The element which has the smallest atomic size.
   (b) The most chemically active element.

X
$_{11}Y$
Z
L
M

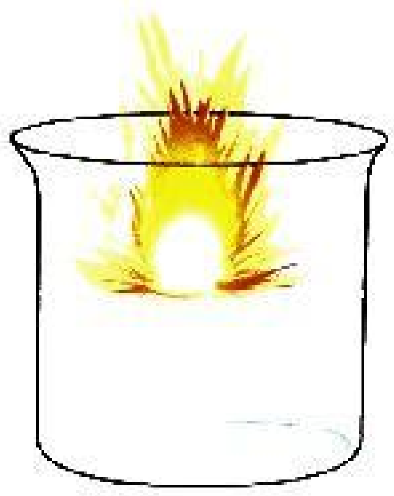
[NB. The letters in the table don't represent the actual symbols of elements]

(3) The opposite figure represents the reaction of a piece of sodium with water :



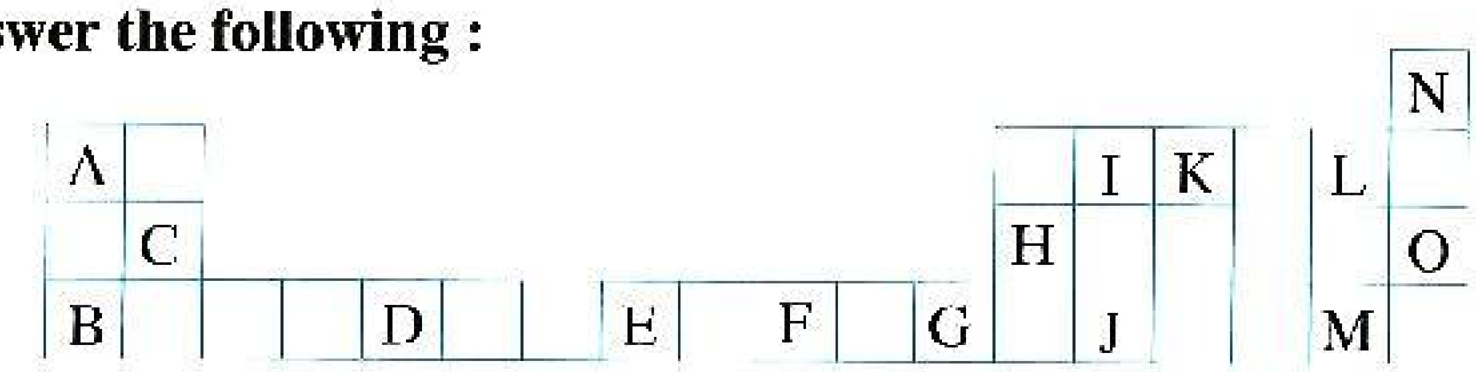
1. What is the name of the evolved gas ?
2. What is the type of the formed solution?
   What is its effect on violet litmus solution ?
3. Write the balanced chemical equation of this reaction.

(4) The opposite figure shows the reaction of element (X) that lies at the beginning of period (4) in the modern periodic table with water :



1. What is the name of element (X) ?
2. What is the name of the produced solution from the reaction ?
3. What is the reason for the presence of element (X) above the water surface ?
4. What happens when replacing element (X) with another (Y) which follows it in the same group ?
5. Describe what happens to the element (X) if water is replaced with kerosene ?

(5) Study the following figure which represents a section of the periodic table, then answer the following :

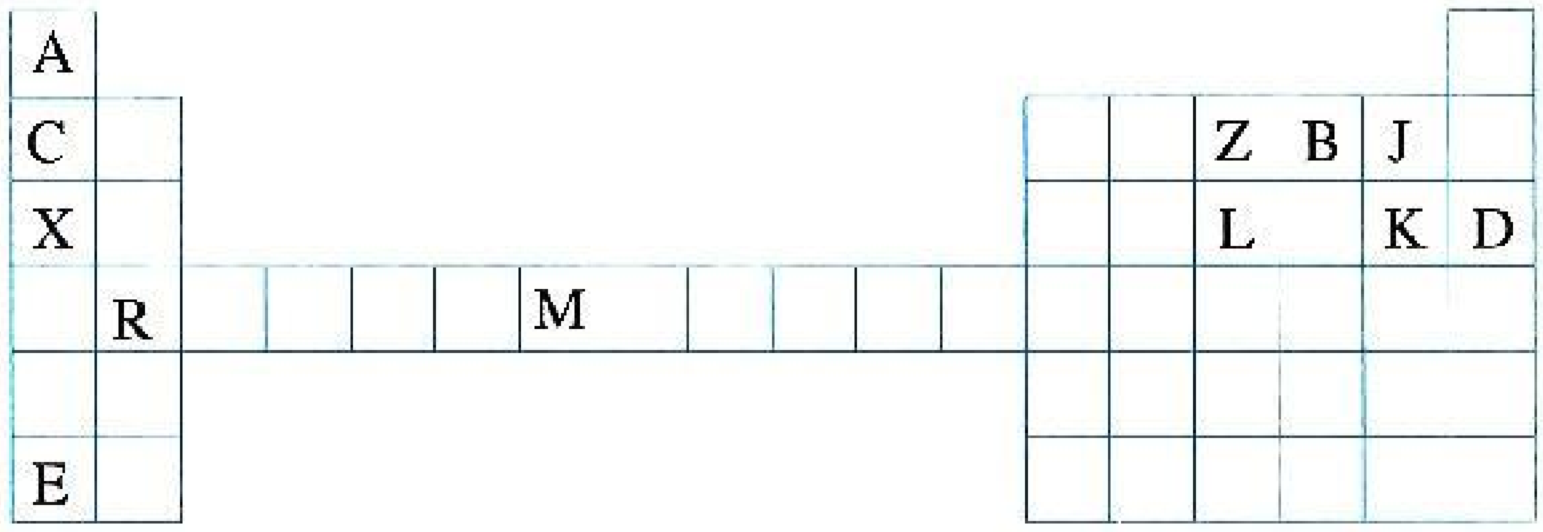


[NB. The letters in the table don't represent the actual symbols of elements]

What is the symbol(s) which indicates the .... ?

(a) Inert gases.
(b) Alkali metals.
(c) Halogens.
(d) The higher active metal.
(e) The higher active nonmetal.

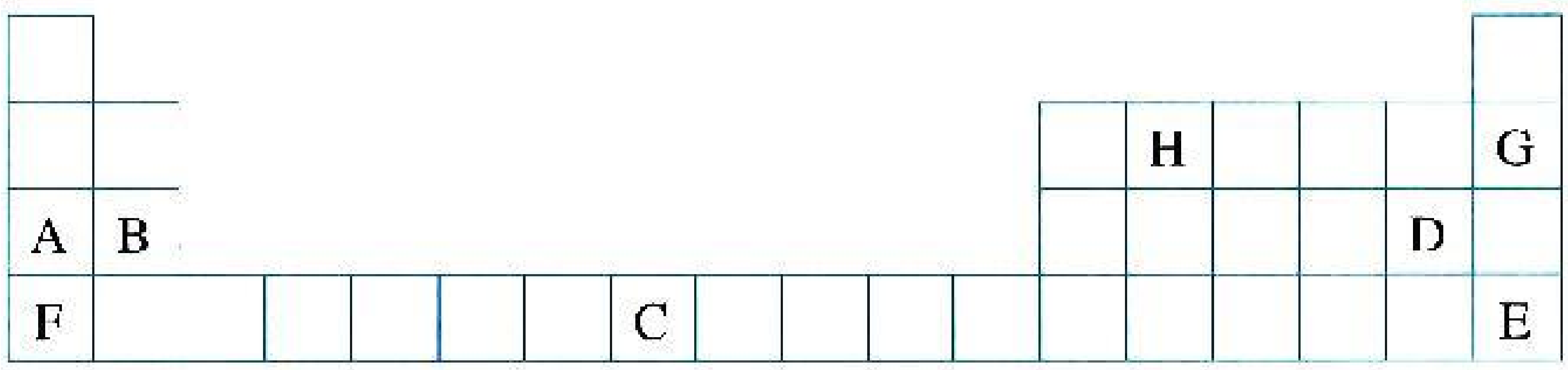
(6) Study the following figure, which represents a part of the modern periodic table, then answer the following :



[NB. The letters in the table don't represent the actual symbols of elements]

1. What are the kinds of elements (X) , (M) and (D) ?
2. Mention the atomic number of the element (B)
3. Mention the symbol, which represents :
   (a) The most active element in group (1A) and mention the name of this group.
   (b) The element which has the largest atomic size in period (2).

(7) Some elements in the periodic table are represented by the letters from A to H and are included in the simplified table as shown below :



[NB. The letters in the table don't represent the actual symbols of elements]

1. Choose the letter(s), which indicates :
   (a) A halogen. (b) The higher active metal.
2. Write the chemical equation, which represents the reaction of water with element "A".
3. **Complete:**
   (a) The molecule of element (D) consists of ....
   (b) The valency of element (F) is .... and that of element D is ....
4. What is the type of the oxide of element (A) ?
5. Why does not element (D) exist in a single state in nature ? And what is its physical state in normal temperature ?

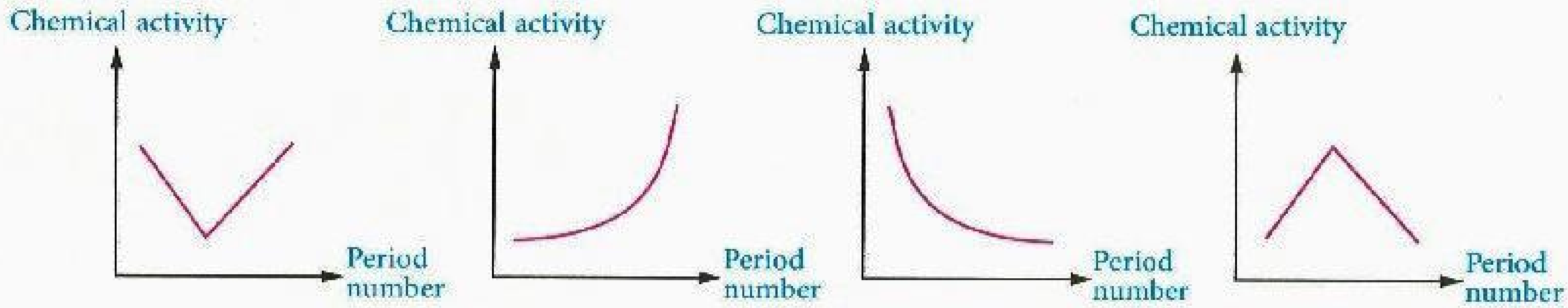
14. Creative thinking :

Why lithium is not kept under kerosene but it is kept under paraffin oil ?

Thinking Skills Questions

1. Choose the correct answer :

1. Graph .... represents the relation between the degree of chemical activity of alkali metals and the period number for each element :



a. b. c. d.

2. Element (X) is from alkali metals, reacts with element (R) which belongs to group (15) to form a compound, whose chemical formula is ....

   a. RX_2 b. X_3R c. RX d. RX_3

3. Element (X) is from alkali metals, reacts with element (Y) from group (17), a salt is produced, whose chemical formula is ....

   a. XY_2 b. X_2Y c. XY d. X_2Y_3

2. Element (X) is located in the third period and belongs to alkali metals, while element (Y) is located in halogens group and also in the third period. Answer the following questions :

a. What is the atomic number of (X) and (Y) ? What is the block of each element ?

b. What is the type of the compound resulted from their combination ? (Mention its formula).

c. Could the element (X) combins with another element which belongs to its group ? (Give a reason for your answer).

3. A metallic element (M) is located in the third period in the modern periodic table, reacts with water forming a compound, its formula is (MOH) with evolving a colourless gas. Determine :

a. The valency of element (M).

b. The atomic number of element (M).

c. The block which element (M) belongs to.

d. The name of the produced gas.

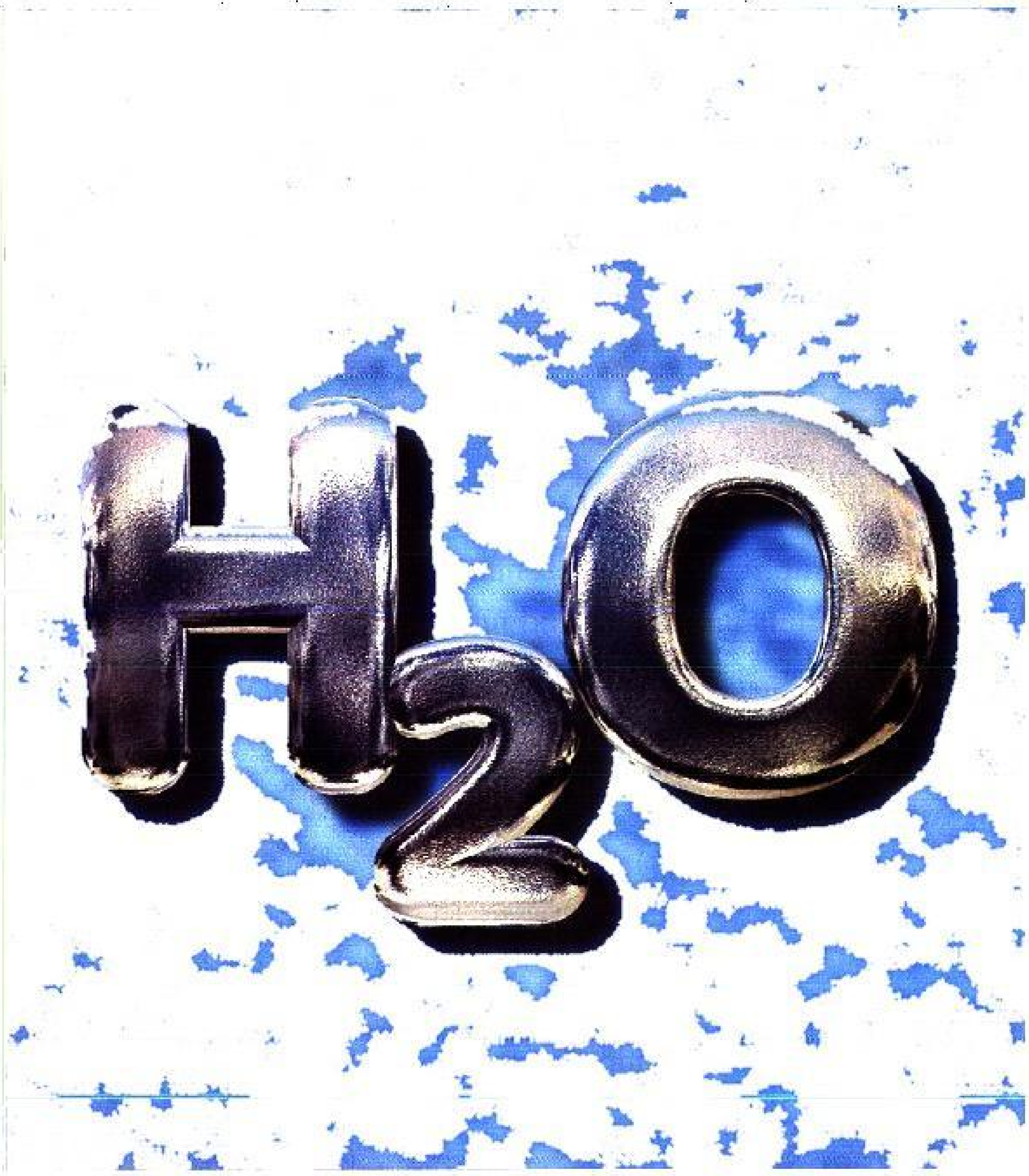
e. The type of oxide of element (M).

4. Do you tend to believe these information ? [Giving reasons] :

1. The properties of sodium element are completely different from those of potassium element.
2. Fluorine forms an ion carries one positive charge in one of its compounds.

Lesson 4

Water



What are the properties of water ?



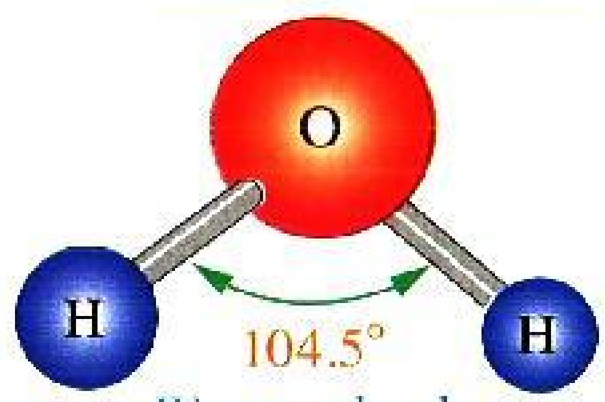
You have known from the previous studies that water is very important for survival of all living organisms and it has several uses in :

- Agricultural fields.
- Industrial fields.
- Personal fields.

Structure of water

Formation of polar water molecule

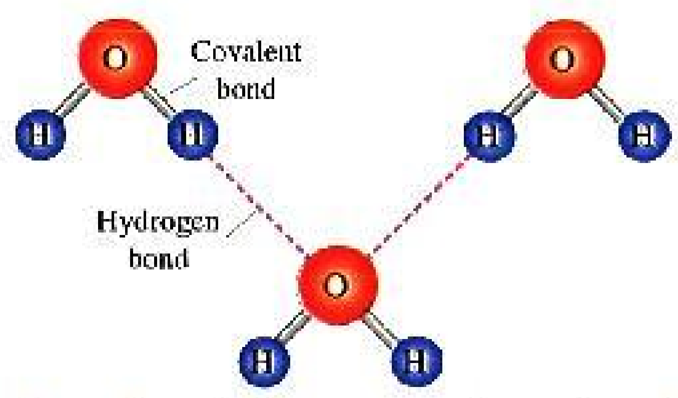
* Water molecule is formed of ***one oxygen*** atom (O) with ***two hydrogen*** atoms (2H) joined together by ***two single covalent bonds***, the angle between them is ***104.5°***



Water molecule

Bonds between water molecules

* **Between polar water molecules originate a type of weak electrostatic attraction known as hydrogen bond G.R.**
  Due to the higher electronegativity of oxygen compared with that of hydrogen.



Hydrogen bonds between water molecules

Hydrogen bond:

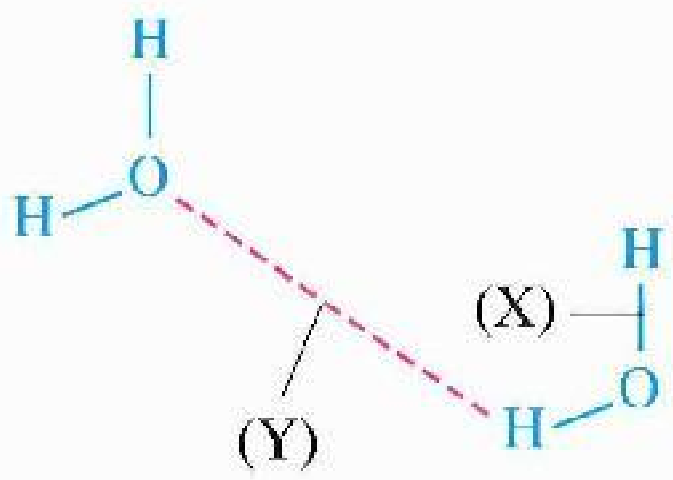
It is a type of weak electrostatic attraction that originates between the molecules of some polar compounds.

* Hydrogen bonds between water molecules are weaker than covalent bonds between the atoms in the same molecules. However hydrogen bonds are considered to be the most important factors which are **responsible for the abnormality of water properties**.

Question

From the opposite figure :

1. What is the type of the two bonds (X) and (Y) ?
2. Which one of them is stronger ?



Properties of water

Some properties of water

A Physical properties

1. It exists in three states
2. It is a good polar solvent
3. Rising of its boiling & its freezing points
4. Its density decreases on freezing

B Chemical properties

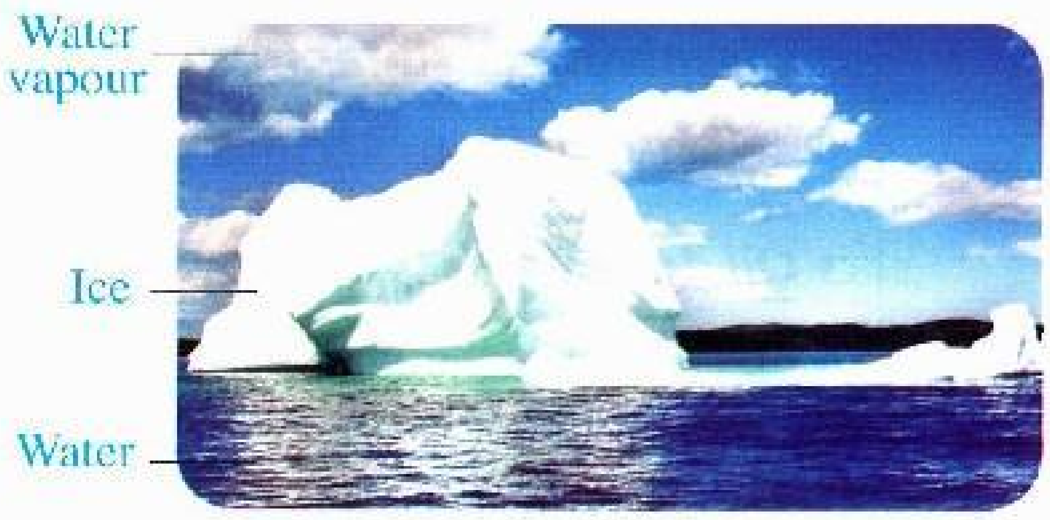
1. It has a neutral effect on both of litmus paper
2. Electrolysis of water

A Physical properties of water

1 Water exists in three states

* Water is an unique matter due to its existence in the three states at the ordinary temperature which are :

- **Solid state** → **Ice**
- **Liquid state** → **Water**
- **Gaseous state** → **Water vapour**



Three states of water

2 Water is a good polar solvent

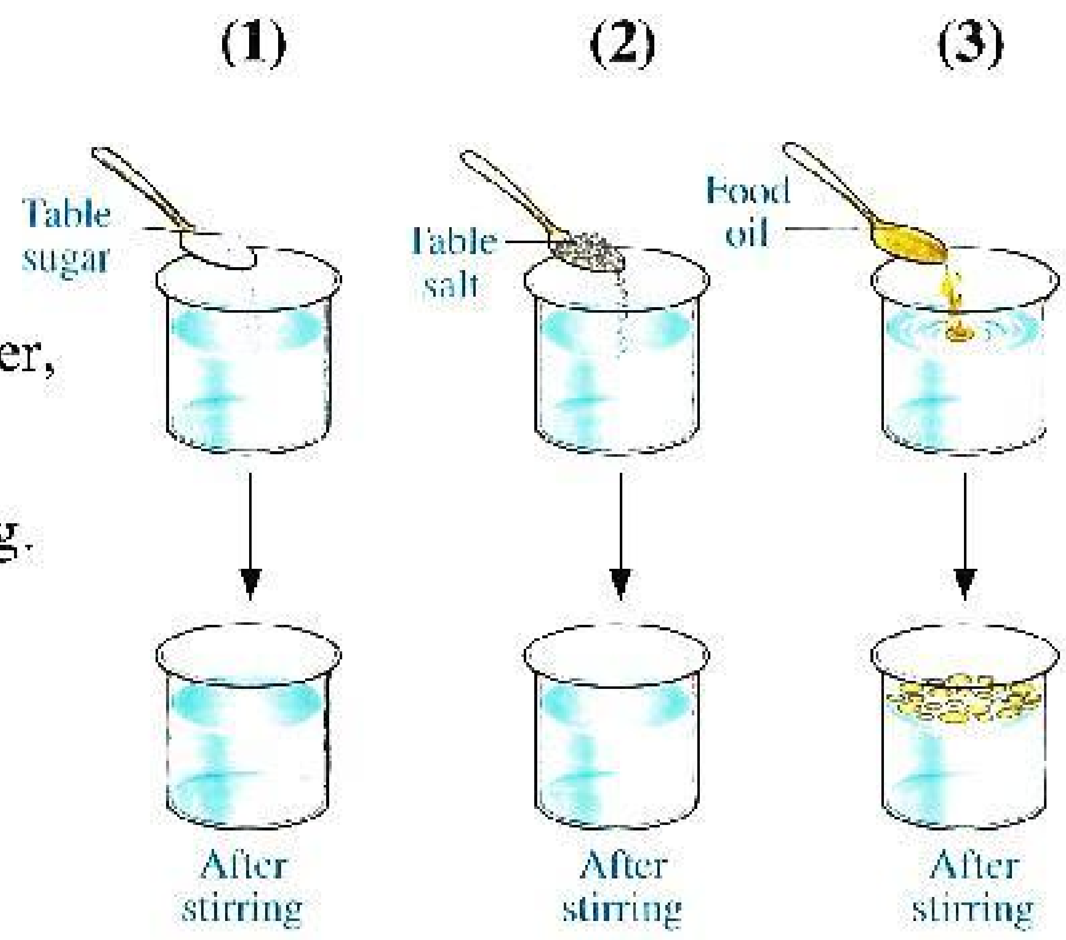
Activity 1 To prove that water is a good polar solvent :

Substances and tools:

- Three beakers.
- Stirring spoon.
- Water.
- Table sugar.
- Table salt.
- Food oil.

Steps :

1. Fill the three beakers with an equal amounts of water.
2. Put a spoon of table sugar in the first beaker, a spoon of table salt in the second and a spoon of food oil in the third with stirring.



Observation :

Both sugar and table salt dissolve in water, while oil doesn't dissolve.

Conclusion:

- **Water is a good polar solvent for :**
  1. Most ionic compounds (such as sodium chloride [table salt]).
  2. Some covalent compounds (such as sugar), which can form hydrogen bonds with water.
- **Most covalent compounds as oil cannot dissolve in water, as it cannot form hydrogen bonds with water.**

G.R.

- ***Dissolving of table salt in water.***
  Because water is a good polar solvent for most ionic compounds (as table salt).
- ***Dissolving of sugar in water although it is among covalent compounds.***
  Because sugar molecules can form hydrogen bonds with water molecules.
- ***Oil doesn't dissolve in water.***
  Because it is a covalent compound which cannot form hydrogen bonds with water.

3 Rising of water boiling point and its freezing point

It was supposed that :

The boiling point of water is less than (**100°C**).	**The freezing** point of water is less than (**0°C**).

But in the normal atmospheric pressure :

Pure water **boils** at **100°C G.R.**	Pure water **freezes** at **0°C G.R.**

This is due to the presence of hydrogen bonds between its molecules.

4 Water density decreases on freezing

*** Water is not like other matters, where its density in solid state (ice) is lower than its density in liquid state (water) G.R.**

Because when the temperature of water becomes less than 4°C, water molecules are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them, so its volume increases and thus its density decreases.

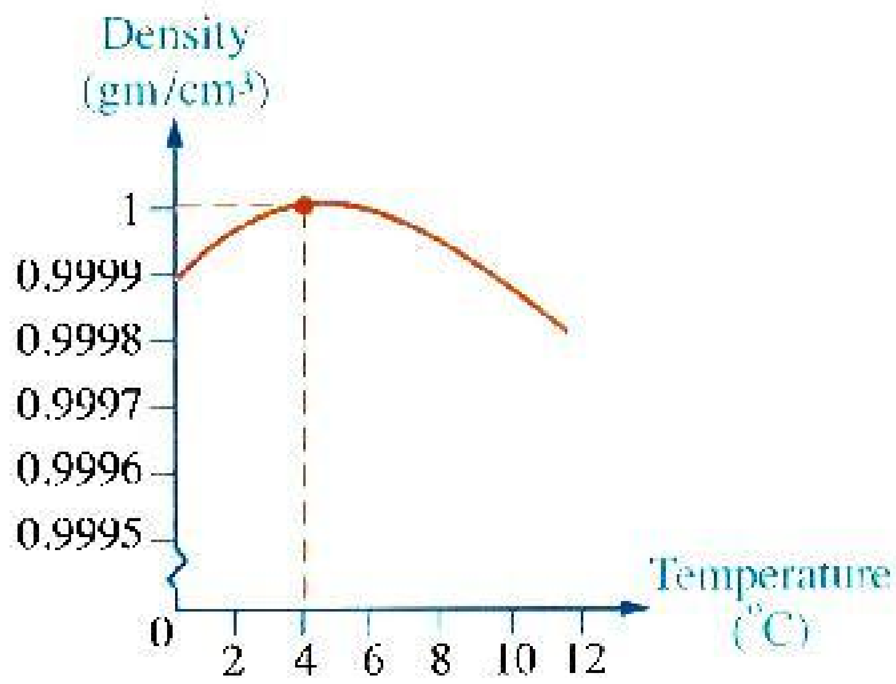


A hexagonal ice crystal

G.R. ***Ice floats on the water surface.***
Because the density of ice is less than the density of water.

➲ **The opposite figure shows the change of water density by changing its temperature, where :**

- The highest value of density of pure water equals 1gm/cm^3 at 4°C.
- The lowest value of density of pure water at 0°C.



G.R.

- ***Although water of oceans freezes at polar zones, the aquatic creatures are still alive.***

  Due to formation of a layer of ice on the surface of liquid water protects the deep water from freezing which preserves the life of the marine organisms in it.



- ***On putting a glass bottle completely filled with water in a freezer, it breaks (explodes).***

  Because when water freezes, its volume increases.



▸ Enrichment information

The density of salty water is larger than that of fresh water, so swimming in the sea is more easier than swimming in swimming pools.

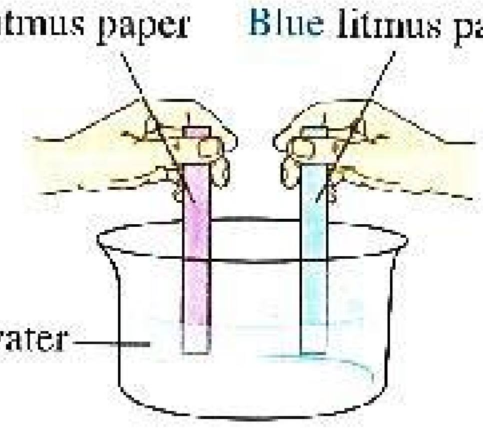
Life application *Dissolving the ice of the freezer quickly :*

- It is possible to dissolve the ice of the freezer quickly after disconnecting the electric current from the fridge :
  - Putting a hot water container in the freezer and close the fridge.
  - Using a hair dryer to direct a hot air current to the formed ice.

B Chemical properties of water

1 Water has a neutral effect on both of litmus paper

Activity (2) Water has a neutral effect on both of litmus paper :

Step	Illustrating figure	Observation
Put two litmus paper (blue and red) in a basin containing pure water.		The colour of the two paper (blue and red) doesn't change.

Conclusion:

The pure water has a neutral effect on both of litmus paper (blue and red).

G.R. ***Pure water doesn't affect blue and red litmus paper.***

Because pure water has a neutral effect on both of litmus paper.

2 Electrolysis of water

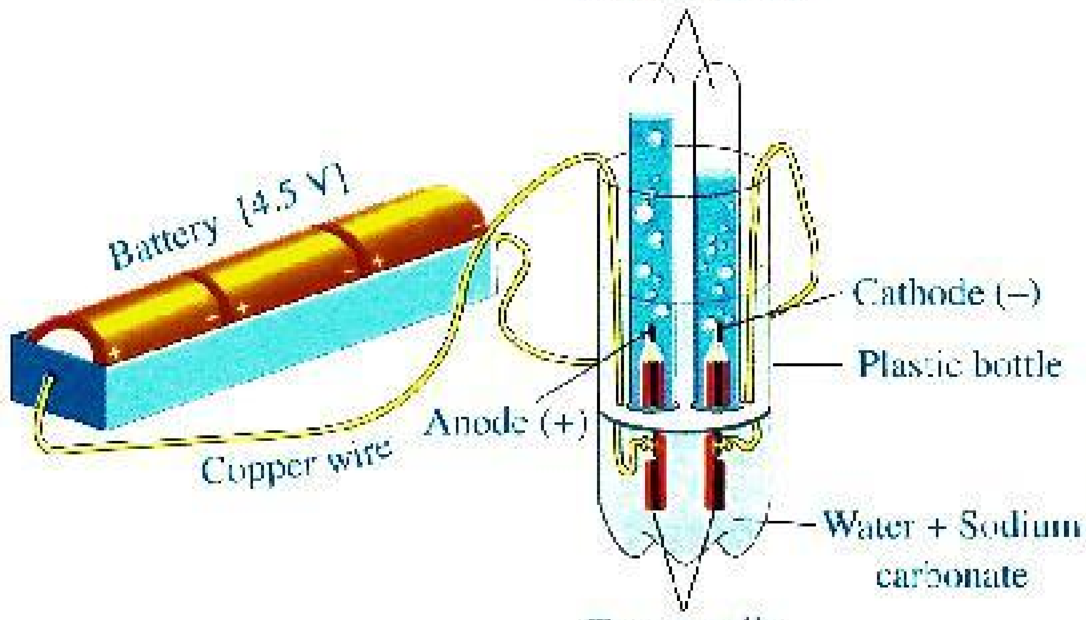
Activity 3 Electrolysis of water :

Substances and tools:

- An empty plastic soda bottle.
- A round piece of foam plate.
- Battery 4.5 volt.
- A spoon of sodium carbonate.
- Two pencils.
- Two test tubes.
- Water.
- Wax gun.
- Two copper wires.

Steps :

1. Use the previous substances and tools to form the electric circuit shown in the figure.
2. Close the circuit for 10 min.
3. Compare between the volume of the evolved gas above the negative pole (cathode) and the volume of the evolved gas above the positive pole (anode).
4. Approach a glowing splint to the gas formed at both cathode and anode.



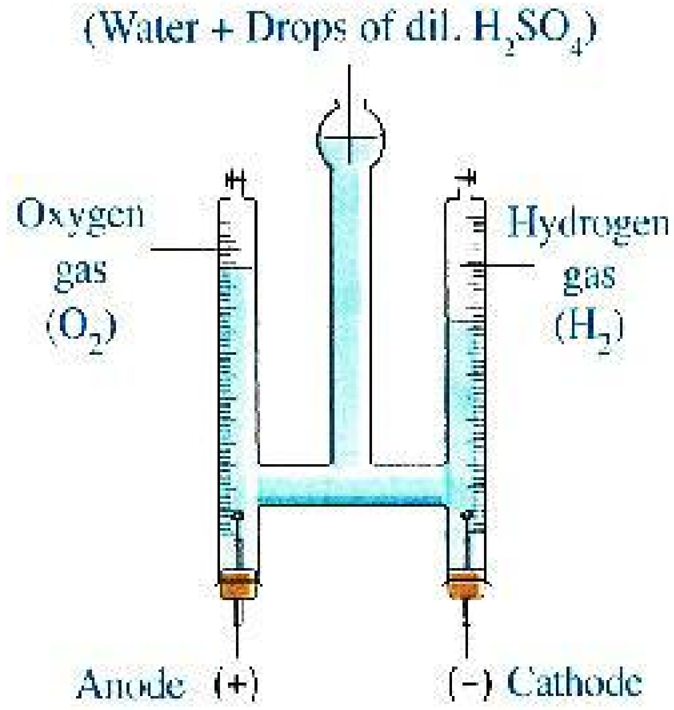
Observations :

1. The volume of the evolved gas above the cathode is twice the volume of the evolved gas above the anode.
2. The evolved gas above the cathode burns with a pop sound, while the evolved gas above the anode makes the glowing splint more glowing.

Conclusion:

- **Hydrogen gas** evolves at the **cathode**.
- **Oxygen gas** evolves at the **anode**.
- The acidified water decomposes by electricity into its two elements (hydrogen and oxygen), the volume of hydrogen gas is twice the volume of oxygen gas at a ratio 2 : 1 by volume respectively.

$$\underset{\text{Water}}{2H_2O} \xrightarrow{\text{Electrolysis}} \underset{\text{Hydrogen}}{2H_2\uparrow} + \underset{\text{Oxygen}}{O_2\uparrow}$$



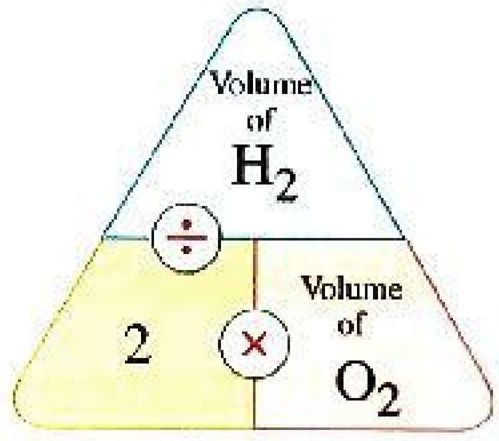
"Hofmann's Voltameter"

*** The previous activity shows :**

*The idea of work of **Hofmann's Voltameter** which is used for the electrolysis of acidified water as shown in the previous figure.*

The relation between the volume of hydrogen gas and oxygen gas on electrolysis of water :

Volume of hydrogen gas (at cathode) = 2 × Volume of oxygen gas (at anode)



G.R.

- ***Adding few drops of dilute sulphuric acid (or sodium carbonate) to pure water during its electrolysis by Hofmann's voltameter.***

  To make water conduct electricity, where the pure water is a bad conductor of electricity.

- ***The glowing of splint increases by approaching it to the anode of Hofmann's voltameter during electrolysis of acidified water.***

  Because oxygen gas evolves at the anode that increases the glowing of splint.

Exercise

On the electrolysis of a certain volume of acidified water by dilute sulphuric acid, the volume of evolved oxygen gas was 2 cm^3. What is the volume of evolved hydrogen gas ?

Answer

∵ The volume of hydrogen gas = 2 × Volume of oxygen gas.

∴ The volume of hydrogen gas = 2 × 2 = 4 cm^3.

Question

- ***Complete :***

  1. Ice crystals have .... shape and large ....
  2. Water has a .... effect on both of litmus paper.

- ***Problem :***

  On the electrolysis of a certain volume of water, the volume of the gas which burns with a pop sound on approaching a glowing splint to it is 6 cm^3. What is the volume of the other gas produced from the electrolysis ?

TRY to answer worksheet **10** in the Notebook

Water pollution

- The continuous increase in agricultural, industrial and developmental activities leads to water pollution.
- Water pollution can be defined as follows :

Water pollution :

It is the addition of any substance to the water which causes **continuous gradual change in water properties** affecting the health and the life of living creatures.

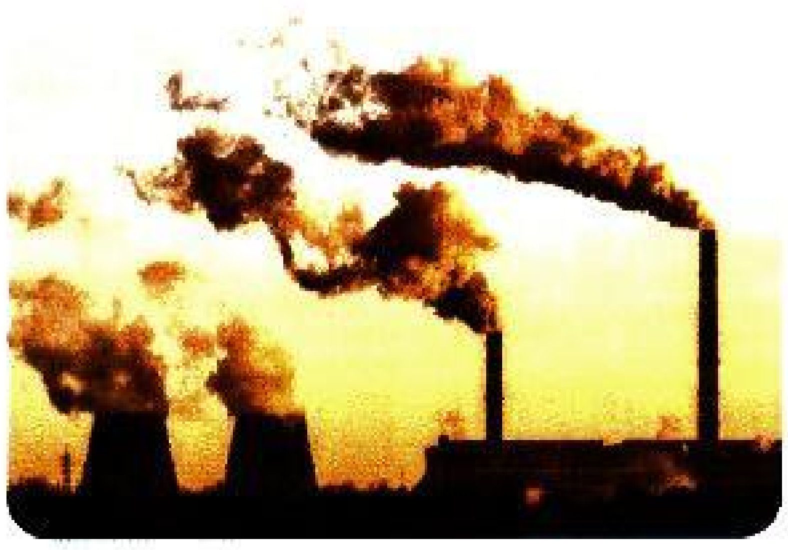


Water pollutants and their harms

• Environmental pollutants are divided generally into two kinds, which are :

	1 Natural pollutants	**2 Artificial pollutants**
Sources	Natural phenomena.	Different human activities.
Examples	• Lightning accompanied by thunder storms. • Death of living organisms. • Volcanic eruptions.	• The overuse of chemical insecticides and fertilizers. • Throwing sewage, factories wastes and leakage of petroleum oil in the seas and rivers. • Burning coal and oil, which leads to the formation of acidic rains and smog.





Types of water pollution

- Water pollution is classified into 4 main types as shown in the following table :

Types of water pollution	Causes (Origins)	Harms (Damages)
① **Biological pollution**	Mixing animals and human wastes with water.  Water pollution with animals' wastes	The infection with many diseases such as : **Bilharzia, typhoid and hepatitis**.
② **Chemical pollution**	Discharging factories wastes and sewage in seas, rivers and canals.  Discharging sewage in canals	The increase in some elements concentration causing great harms as : 1. **The death of brain cells :** When eating continuously fish whose bodies contain high concentration of **lead**. 2. **Blindness :** When drinking continuously water containing high concentration of **mercury**. 3. Increases the infection rates of **liver cancer :** When drinking continuously water containing **arsenic**.
③ **Thermal pollution**	Rising of temperature of some marine zones which use water for cooling the nuclear reactors.  Nuclear reactor	Destroy the marine creatures found in these zones due to the separation of the dissolved oxygen in water.  Destroy the marine creatures
④ **Radiant pollution**	- Dumping the atomic wastes in oceans and seas. - Leakage of radioactive materials from nuclear reactors.	**For illustration** *- Increases the infection rates of cancer.*

Note

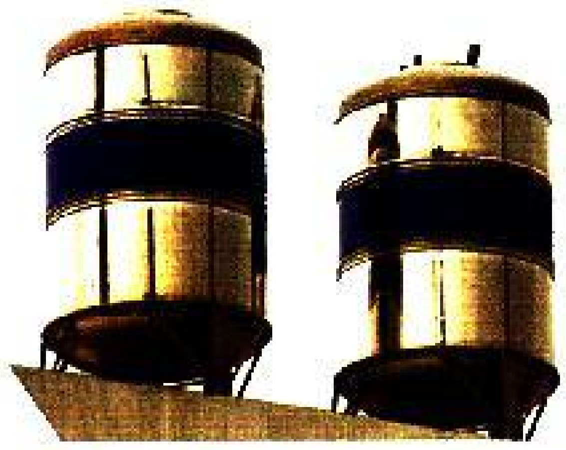
The nuclear reactors cause both thermal water pollution and radiant water pollution.

Protection of water from pollution

- **There are many behaviours that must be taken in consideration to protect water from pollution in Egypt, such as :**



1. Prevention of getting rid of sewage, wastes of factories and dead animals in rivers or canals.



2. Disinfection of the drinking water tanks which are found on the roofs of buildings in a periodical manner.



3. **Don't store the tap water in empty plastic bottles** G.R.
Because plastic reacts with **chlorine gas** (which is used as water disinfectant) leading to the increase in the infection rates of **cancer**.



4. Spreading environmental awareness among people to protect water from pollution.



5. Developing the stations of water purification and doing a periodical analysis to determine the rate of water validity for drinking.

TRY to answer worksheet 11
- General Exercise of the School Book on Unit 1
- Model exams on Unit 1

in the Notebook

Remember

Lesson Four

- Water molecule is formed of one oxygen atom (O) with two hydrogen atoms (2H) joined together by two single covalent bonds.

- **Hydrogen bond :** It is a type of weak electrostatic attraction that arises between the molecules of some polar compounds.

- **Physical properties of water :**
  - Water exists in three states which are solid, liquid and gaseous.
  - Water is a good polar solvent.
  - Pure water in the normal atmospheric pressure boils at (100°C) and freezes at (0°C).
  - Density of water in solid state (ice) is lower than its density in liquid state (water).

- **Chemical properties of water :**
  - It has a neutral effect on both of litmus paper.
  - It can be decomposed electrically.
  - Hofmann's voltameter is used for the electrolysis of acidified water as shown in the following equation :

$$2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$$

- **Water pollution :**

  It is the addition of any substance to the water, which causes continuous gradual change in water properties affecting the health and the life of living creatures.

Questions ? on lesson four

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. Water molecule is composed of ....
   a. one oxygen atom and one hydrogen atom.
   b. two oxygen atoms and one hydrogen atom.
   c. one oxygen atom and two hydrogen atoms.
   d. two oxygen atoms and two hydrogen atoms.

2. In a water molecule, oxygen atom combines with two hydrogen atoms by two .... bonds.
   a. double covalent b. ionic
   c. single covalent d. hydrogen

3. In a water molecule, the angle between the two single covalent bonds is ....
   a. 64° b. 104° c. 104.5° d. 140.5°

4. 📖 There are .... bonds among water molecules.
   a. hydrogen b. covalent c. ionic d. metallic

5. Water exists in the .... at ordinary temperature.
   a. solid state only b. liquid state only
   c. gaseous state only d. three states

6. All of the following are from substances that dissolve in water except ....
   a. magnesium oxide. b. food oil. c. sodium chloride. d. sugar.

7. The high boiling point of water is due to the presence of .... bonds between its molecules.
   a. single covalent b. double covalent c. hydrogen d. ionic

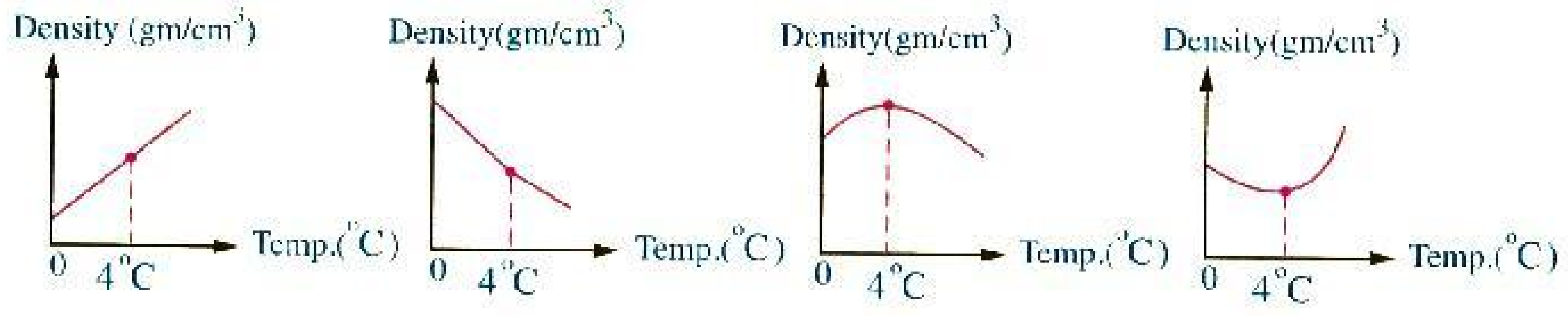
8. The snow crystal has .... shape.
   a. octagonal b. quadrilateral c. pentagonal d. hexagonal

9. Ice crystals are characterized by all the following except they have ....
   a. lower density than that of liquid water. b. large volume.
   c. hexagonal shape. d. higher density than that of liquid water.

10. The density of water in a solid state is ....
    a. less than its density in liquid state. b. equal to its density in liquid state.
    c. greater than its density in liquid state. d. half of its density in liquid state.

11. The pure water boils at .... °C
    a. 0 b. 4 c. 90 d. 100

12. The figure .... represents the change in water density by changing the temperature.



a. b. c. d.

13. Water has a/an .... effect on both of litmus paper.

a. basic b. acidic c. neutral d. alkaline

14. All of the following are among the properties of water except ....

a. it has a neutral effect on both of litmus paper.
b. it is a polar compound.
c. its volume increases by freezing.
d. it decomposes by heat into its elements.

15. A liquid boils at 100°C. What is the other property, which confirms that it is pure water ? ....

a. Sugar dissolves in it.
b. Its density decreases on freezing.
c. It has a neutral effect on both of litmus paper.
d. It evaporates on heating.

16. On the electrolysis of acidified water by using Hofmann's voltameter, the ratio between the volume of the evolved gas at the positive pole to the volume of the evolved gas at the negative pole is .... respectively.

a. 1 : 2 b. 1 : 1 c. 2 : 1 d. 3 : 1

17. In the electrolysis of acidified water by using "Hofmann's voltameter", the volume of hydrogen gas that evolves is (16 cm^3), so the volume of oxygen gas that evolves is .... cm^3

a. 16 b. 6 c. 8 d. 10

18. The volume of hydrogen gas evolving from acidified water electrolysis equals .... the oxygen volume.

a. that of b. twice c. half d. four times

19. All of the following are natural environmental pollutants except ....

a. volcanic eruptions.
b. death of living organisms.
c. discharge of factories residues.
d. lightning accompanied by thunder storms.

20. Mixing animals and human wastes with water causes .... water pollution.

a. chemical b. biological c. thermal d. radiant

21. All of the following diseases are caused by biological water pollution except .... disease.
    a. cancer b. bilharzia c. hepatitis d. typhoid
22. Increasing the concentration of .... in drinking water causes blindness.
    a. lead b. arsenic c. mercury d. chlorine
23. Arsenic increases the infection rate by ....
    a. liver cancer. b. brain cancer. c. hepatitis. d. typhoid.
24. .... water pollution causes the death of marine creatures due to the separation of the dissolved oxygen in water.
    a. Biological b. Chemical c. Thermal d. Radiant
25. Which of the following behaviours causes radiant water pollution ? ....
    a. Discharging of sewage in seas.
    b. Leakage of radioactive materials from nuclear reactor.
    c. Discharging factories residues and chemicals in seas.
    d. Mixing animals and human wastes with water.

2. Choose from column (B) what suits it in column (A) :

(A) Probable harms	(B) Responsible pollutant
1. Death of brain cells.	a. Lead
2. Liver cancer.	b. Sodium
3. Blindness.	c. Mercury
	d. Arsenic

3. Put (✓) or (×) and correct the wrong ones :

1. Water molecule consists of one hydrogen atom and two oxygen atoms. ( )
2. Water molecules are linked together by ionic bonds. ( )
3. Water molecule contains one double covalent bond. ( )
4. Covalent bonds in water molecule are stronger than hydrogen bonds. ( )
5. Both oil and sugar are covalent compounds. ( )
6. The density of water in liquid state is higher than its density in the solid state. ( )
7. Water density increases on freezing. ( )
8. Ice crystals have round shape and small volume. ( )
9. Water has a neutral effect on both of litmus paper. ( )
10. During electrolysis of acidified water, the volume of the evolved gas above the anode is half the volume of the evolved gas above the cathode. ( )
11. During electrolysis of acidified water, oxygen gas evolves at the cathode, while hydrogen gas evolves at the anode. ( )

12. Hofmann's voltameter is used for water ionization. ( )
13. Volcanic eruptions and lightning accompanied by thunder storms are from artificial environmental pollutants. ( )
14. Chemical pollution of water causes many diseases such as typhoid and hepatitis. ( )
15. Eating food containing high concentration of mercury causes the death of brain cells. ( )
16. Discharging factories residues in seas and rivers causes radiant water pollution. ( )

4. Write the scientific term of each of the following :

1. A molecule that consists of two hydrogen atoms and one oxygen atom.
2. A kind of bonds, which arises between oxygen atom and each of hydrogen atoms in water molecule.
3. • A type of weak electrostatic attraction which arises among molecules of some polar compounds.
   • A chemical bond arises between water molecules and each other.
   • A type of bond which is responsible for the abnormal properties of water.
4. A good polar solvent for most of ionic compounds and some of covalent compounds.
5. The apparatus which is used in water electrolysis.
6. The positive pole in Hofmann's voltameter.
7. • The gas which evolves above the anode during water electrolysis.
   • The gas which makes the glowing splint more glowing.
8. The negative pole in Hofmann's voltameter.
9. • The gas which evolves above the cathode during water electrolysis.
   • The gas which burns with a pop sound by using a glowing splint.
10. The addition of any substance to water, which causes continuous gradual change in water properties affecting the health and life of living creatures.
11. A kind of environmental pollutants, which arises from natural phenomenon.
12. A kind of environmental pollutants, which arises from different human activities.
13. • A kind of water pollution, which arises from mixing animal and human wastes with water.
    • A kind of water pollution, which causes the infection by many diseases such as typhoid.
14. A kind of water pollution which arises from the discharge factories wastes and sewage in seas and rivers.
15. A water pollutant which causes the death of brain cells.
16. A water pollutant which causes blindness when its concentration increases in water.
17. A water pollutant which increases the infection rate by liver cancer.
18. • A type of water pollution that results from the increase in the temperature of water which is used in cooling nuclear reactors.
    • A type of water pollution, which causes the death of marine creatures due to the separation of the dissolved oxygen in water.
19. A kind of water pollution, which results from dumping atomic wastes in the oceans and seas.

5. Complete the following statements :

1. Water is used in many fields such as .... , ... and ....
2. Water molecule is composed of one .... atom and two .... atoms.
3. Water molecules are linked together by .... bond due to the higher .... of oxygen with compared to hydrogen.
4. The bond between hydrogen atom and oxygen atom in water molecule is .... bond, while bonds among water molecules are .... bonds.
5. Water is a good polar .... as it has the ability to dissolve most .... compounds.
6. .... is an example of ionic compounds, while .... is an example of covalent compounds, which dissolve in water.
7. Most covalent compounds such as .... can't dissolve in water as they can't form .... bonds with water.
8. Pure water boils at .... and freezes at ....
9. The high boiling point of water is due to the presence of .... bonds between its molecules.
10. When the temperature of water becomes less than 4°C, its density .... , while its volume ....
11. When the temperature of water decreases below ...., its molecules are collected together by .... bonds forming ice crystals.
12. Ice crystals have .... shape and large ....
13. Water has a .... effect on both of litmus paper.
14. .... is an apparatus which is used for the electrolysis of water by using .... energy.
15. In Hofmann's voltameter, the positive pole is called .... , while the negative pole is called ....
16. During the electrolysis of acidified water by Hofmann's voltameter, ... gas evolves at the anode, while .... gas evolves at the cathode.
17. If the volume of the evolved gas at the anode in Hofmann's voltameter is 7 cm^3 therefore, the volume of the evolved .... gas at the cathode is .... cm^3
18. Environmental pollutants are classified into .... pollutants and .... pollutants.
19. Water pollution is classified into four main types, which are .... , chemical, ... and .... pollution.
20. Biological water pollution causes the infection by many diseases such as .... , typhoid and ....
21. Eating food containing high concentration of .... causes the death of the .... cells.

22. Increasing the mercury concentration in drinking water causes .... , while increasing arsenic concentration in it, increases the infection rate by ....

23. Mixing animals and human wastes with water causes .... water pollution, while dumping the atomic wastes in oceans causes .... water pollution.

24. Chemical water pollution is produced from the discharging .... wastes and .... in seas and rivers.

25. .... water pollution is produced due to increasing the .... of some marine zones which use water for cooling the nuclear reactors.

26. Among the protection ways of water from pollution are developing the stations of water .... and disinfection of the .... in a periodical manner.

27. We must not store the tap water in .... bottles because plastic reacts with .... gas leading to the increase in the infection rates of ....

6. Complete the following table :

Origin of water pollution	Kind of pollution	Harms
1. Discharging factories wastes and sewage in seas and rivers.	.... pollution	• Blindness • .... • ....
2.	Biological pollution	• .... • Typhoid • ....
3.	Radiant pollution	________
4. Using of water of some marine zones for cooling the nuclear reactors.	.... pollution	....

7. Give reasons for the following :

1. • The boiling point of water is high.
   • The abnormality of water properties.
2. The presence of hydrogen bonds between water molecules.
3. Dissolving of table salt in water.
4. Water has the ability to dissolve most ionic compounds.
5. Although sugar is a covalent compound, it dissolves in water.
6. Oil doesn't dissolve in water.
7. The density of water in solid state (ice) is less than that its density in liquid state.
8. Ice floats on the water surface.

9. The volume of 5 gm of ice is more than the volume of 5 gm of water at (4°C).
10. Although water of oceans freezes at polar zones, the aquatic creatures are still alive.
11. On putting a glass bottle completely filled with water in a freezer, it will break.
12. Pure water doesn't affect litmus paper dye.
13. Adding few drops of dilute sulphuric acid to pure water during its electrolysis by Hofmann's voltameter.
14. The glowing of splint increases by approaching it to the anode of Hofmann's voltameter during electrolysis of acidified water.
15. Biological water pollution affect the human health.
16. Chemical water pollution is more dangerous than biological water pollution.
17. It is dangerous to eat fish containing high concentration of lead.
18. Thermal pollution of water leads to the death of marine creatures in it.
19. We should not keep the tap water in plastic bottles of mineral water.

8. What is meant by ...?

1. Hydrogen bond.
2. Water pollution.

9. What are the results of the following ...?

1. Water molecules are linked together by hydrogen bonds.
2. Decrease in water temperature less than 4°C
3. Putting a glass bottle filled with water in the freezer for a long time.
4. Passing of electric current through Hofmann's voltameter containing acidified water.
5. Water is polluted by wastes of human and animal.
6. Eating fish contain high concentration of lead.
7. Increase in the concentration of mercury in drinking water.
8. Increase in the ratio of arsenic in drinking water.
9. Dumping the atomic wastes in oceans and seas.
10. Storing water in plastic bottles of mineral water.

10. What is the effect of each of the following on the water environment ?

1. Mixing animal and human wastes with water.
2. Drainage of factories wastes in seas and rivers.
3. Using of seas and rivers water as a renewable source for cooling process of the nuclear reactors.

11. Compare between each of the following :

1. Table salt and food oil [related to : type of the compound - dissolving in water].
2. Bonds between atoms of a water molecule and bonds between water molecules [related to : type - strength].
3. Pure water and acidified water [related to : electric conductivity].
4. Natural environmental pollutants and artificial environmental pollutants.
5. Biological water pollution and chemical water pollution [related to : origin - harms].
6. Thermal water pollution and radiant water pollution [related to : origin of each of them].

12. Mention the importance of :

1. Water.
2. Hofmann's voltameter.

13. The nuclear reactors cause thermal water pollution and radiant water pollution. Explain this phrase.

14. Variant questions :

(1) **Mention the properties of water.**

(2) **Mention the relation between water density and its temperature.**

(3) **If you have three bottles :**

- Bottle (1) has pure water, passing in it carbon dioxide gas.
- Bottle (2) has pure water, added to it an amount of magnesium oxide powder.
- Bottle (3) has pure water, without additions.

How can you differentiate between the three bottles ?

(4) **Show by symbolic chemical balanced equations how to get hydrogen from water "by two different ways".**

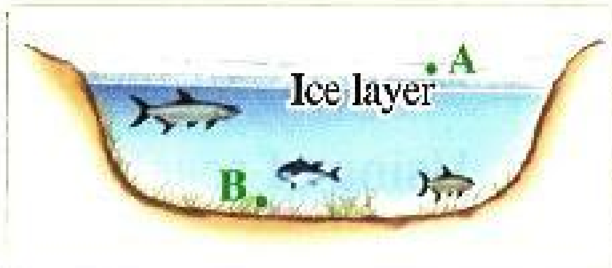
(5) **How to keep water from pollution ?**

15. Draw a diagrammatic figure with labels for the device which is used in the electrolysis of water.

(Mention the equation of the reaction).

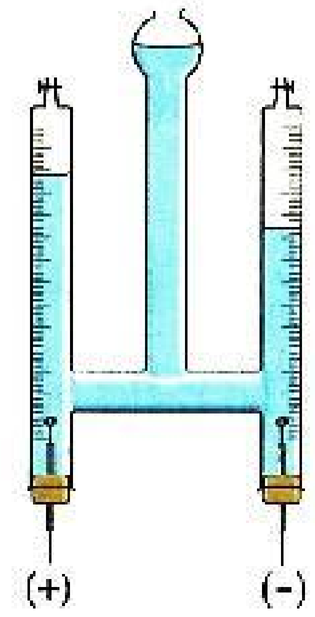
16. Study the following figures, then answer the questions :

(1) **From the opposite figure, answer the following :**



1. What are the temperatures at points (A) and (B) ?
2. At which point the density of water is the largest ?

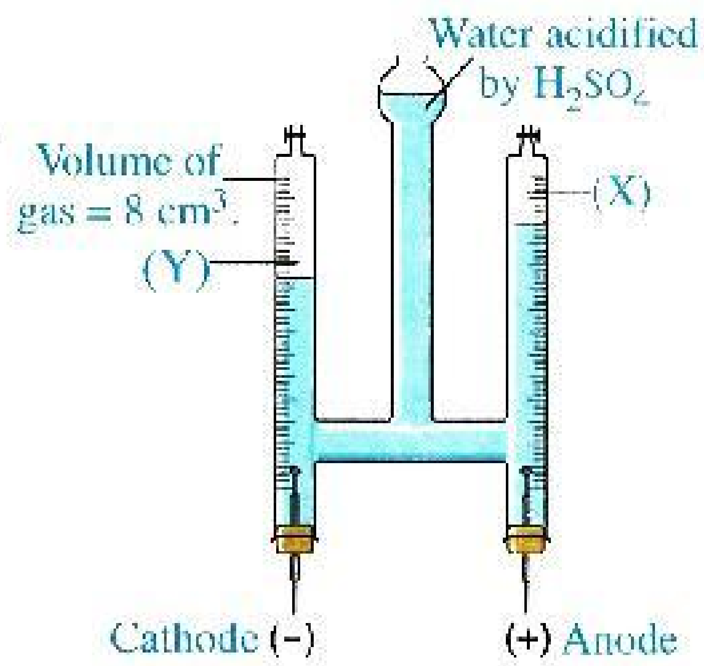
(2) **The opposite figure represents Hofmann's voltameter which is used in water electrolysis :**



1. Write the chemical equation, which expresses the reaction.
2. What is the volume of the gas, which burns with a pop sound on approaching a glowing splint to it, if the volume of the other gas is 6 cm^3 ?
3. What is the name of the collected gas at :

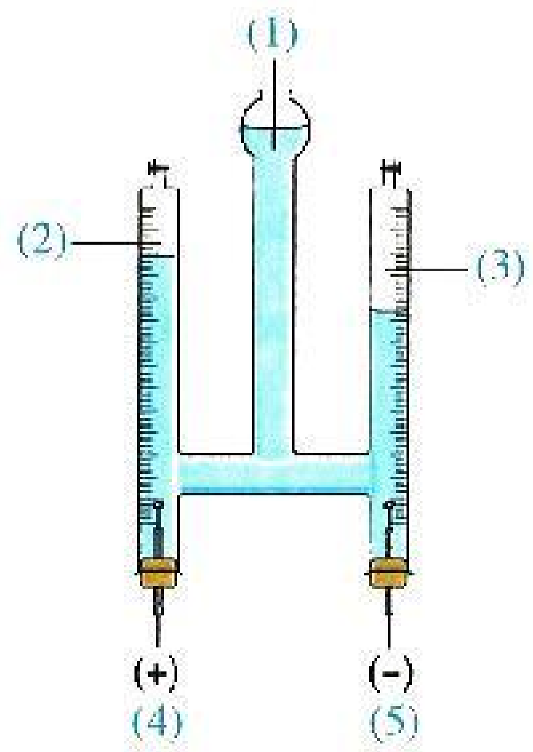
   a. Cathode. b. Anode.

(3) **During the electrolysis of acidified water by using Hofmann's voltameter (as shown in the opposite fig.), it was found that the volume of the collected gas in branch Y = 8 cm^3.**



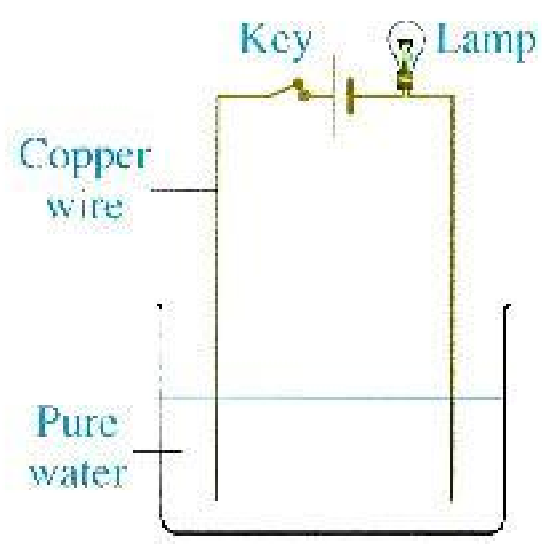
1. What is the name of the collected gas in each of the two branches (X and Y) of the voltameter ?
2. What is the volume of the gas in branch (X) ?

(4) **From the opposite figure, answer the following questions :**



1. What is the name of this apparatus ? What is its importance ?
2. Label the numbers (1) , (2) , (3) , (4) and (5).
3. Write the balanced chemical equation of this reaction.
4. After opening the tap, what happens if a glowing splint is put above the anode and above the cathode ?
5. Calculate the volume of the gas that evolves at the anode if the volume of the gas that evolves at the cathode is 20 cm^3.

(5) **From the opposite electric circuit :**



1. Does the lamp illuminate or not ? **(Give a reason).**
2. What will happen if you add drops of sodium carbonate to the pure water ? **(Give a reason).**

17. Creative thinking :

What do you expect for the River Nile pollution after 50 years ?

Thinking Skills Questions

1. Choose the correct answer :

1. The ratio between the density of water at 4°C to its density at zero°C is .... one.

   a. more than   b. less than   c. equal to

2. The density of pure water in the solid state is .... 1 gm/cm^3.

   a. more than   b. equal to   c. less than

3. When we put 1 kg of water at 4°C in the freezer to change it into ice, its mass ....

   a. increases.   b. decreases.   c. doesn't change.

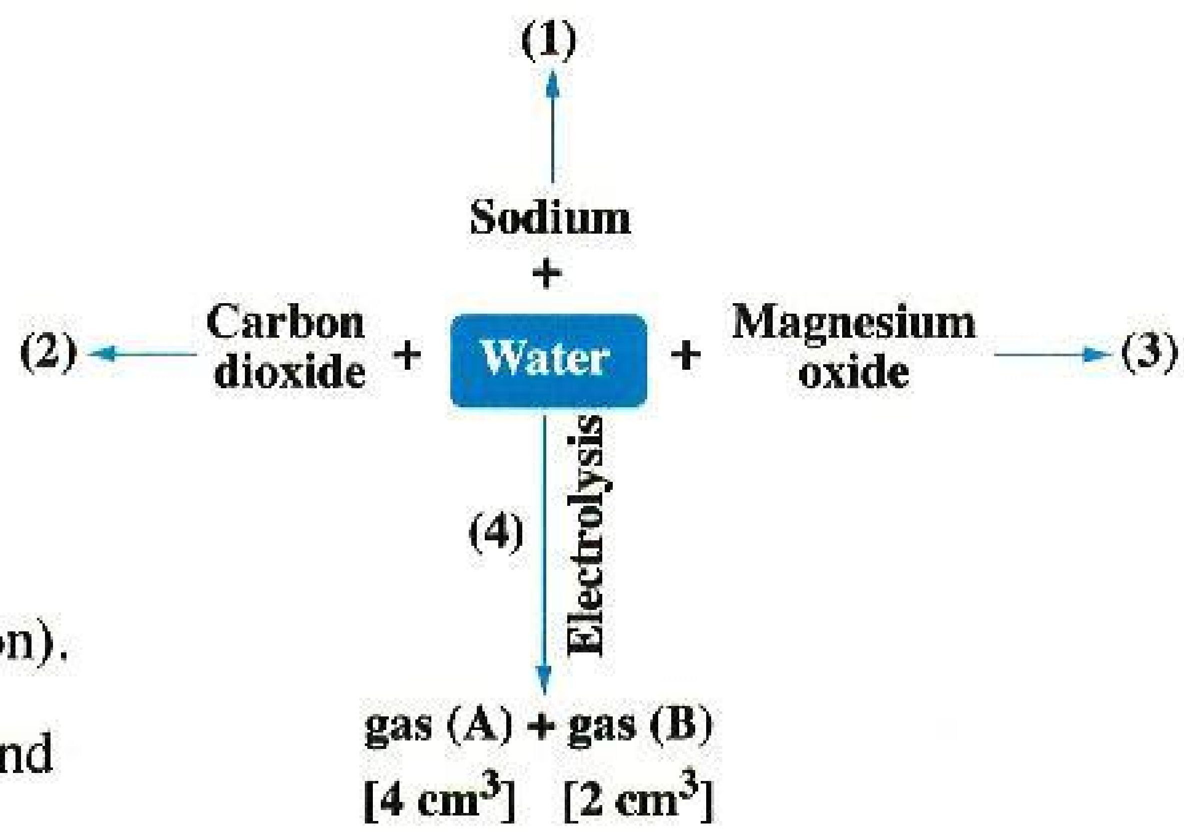
4. The volume of a mass of water at 30°C is .... the volume of the same mass at 1°C.

   a. more than   b. equal to   c. less than

5. If the summation of the volume of the two evolved gases at the two poles of Hofmann's voltameter is 60 cm^3, so the volume of hydrogen and oxygen gases respectively is ....

   a. 20 cm^3 , 40 cm^3.   b. 40 cm^3 , 20 cm^3.   c. 30 cm^3 , 30 cm^3.

2. In the opposite figure :



a. Write the names of the resultants of the reactions (1) , (2) and (3).

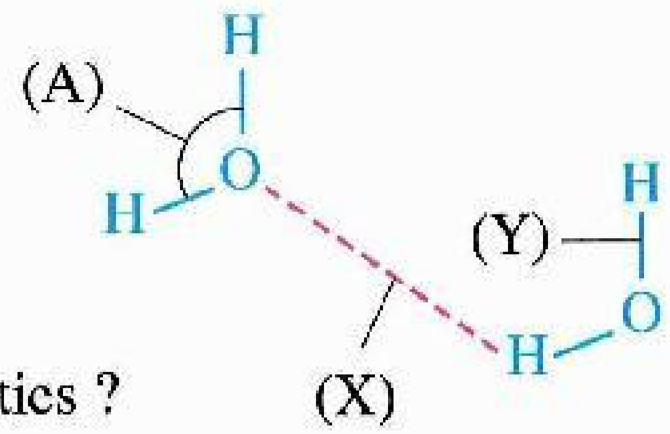
b. What is the type of solution formed from the reactions (2) and (3) ?

c. What is the effect of the solution formed from reaction number (1) on the litmus paper ? (Give a reason).

d. (1) Mention the name of the gas (A) and gas (B) which are produced from the electrolysis of acidified water.

   (2) What is the device used in the process number (4) ?

3. From the opposite figure, answer the following :



1. Mention the kind of bonds (X) and (Y).
2. Which one is stronger ?
3. Which one is responsible for the abnormality of water properties ?
4. Complete :

   (a) The figure represents the structure of .... molecules.

   (b) The angle (A) equals ....

4. What happens if ... ?

1. There are no hydrogen bonds between water molecules.
2. The density of water at (– 6°C) is equal to its density at 5°C in cold polar regions.

UNIT

2 The Atmosphere and Protecting the Planet Earth

Lesson 1 The Atmospheric Layers.

Lesson 2 Erosion of Ozone Layer and Global Warming.



Unit Objectives :

By the end of this unit, students will be able to :

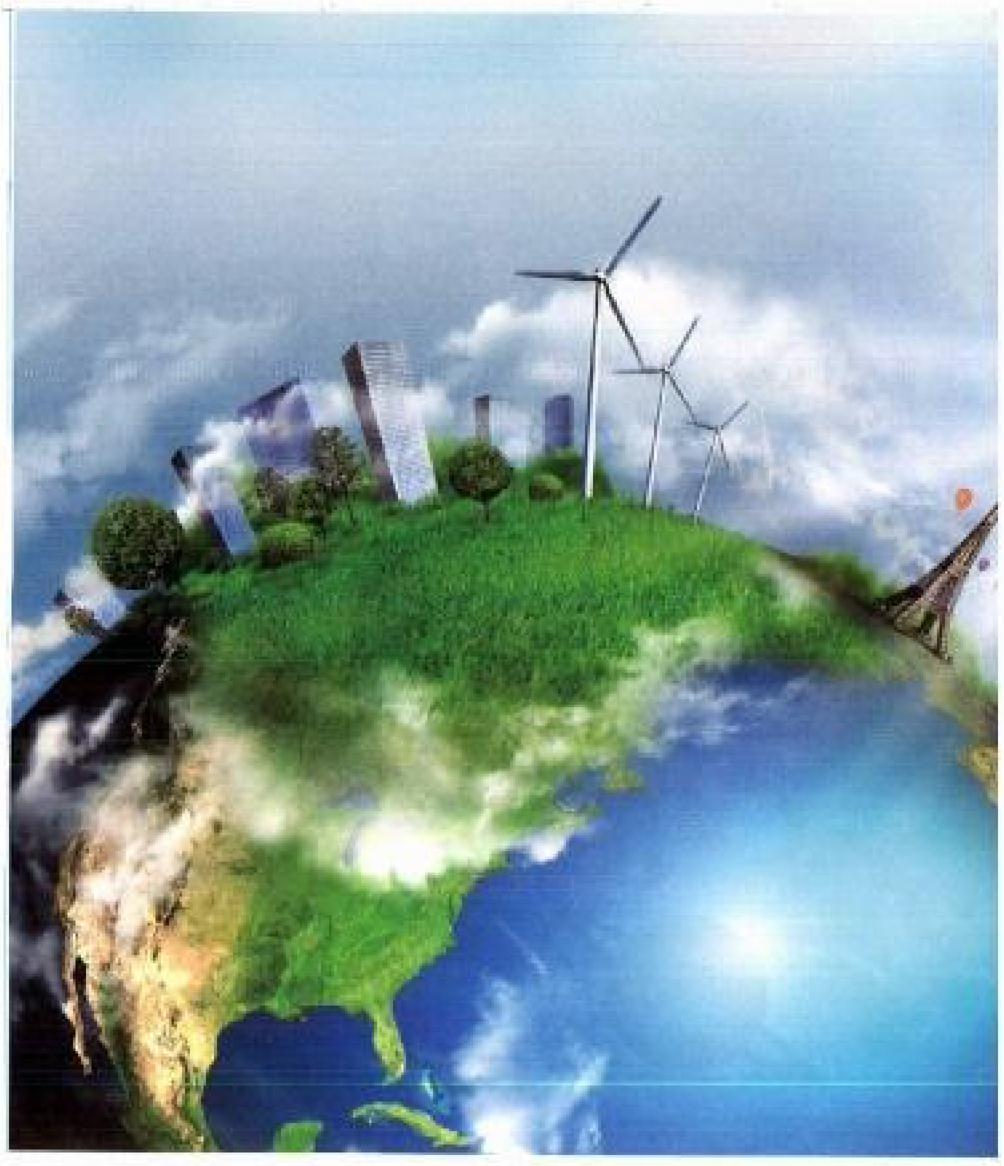
- Know the concept of atmospheric pressure and layers of atmospheric envelope.
- Interpret the change of atmospheric pressure with changing height above sea level.
- Appreciate the importance of instruments that measure atmospheric pressure.
- Describe the characteristics of atmospheric layers.
- Compare among the characteristics of atmospheric layers.
- Conclude the importance of each layer of atmosphere.
- Recognize the importance of studying each layer of the atmosphere.
- Appreciate the role of scientists to reach devices measuring atmospheric pressure.



- Know the composition of ozone gas.
- Conclude the steps of ozone formation.
- Aware of the importance of ozone layer for the human and living organisms.
- Describe harmful effects for pollutants of ozone layer.
- Determine ways to protect ozone layer.
- Describe the global warming phenomenon and greenhouse effect.
- Identify greenhouse gases.
- Explain the increase in the temperature of atmospheric envelope of the Earth.
- Determine the negative effects resulted from the rising temperature of the Earth's atmosphere.

Lesson 1

The Atmospheric Layers



What are the atmospheric layers and their importance?

Air forms a gaseous envelope surrounds the Earth known as **atmospheric envelope** or **atmospheric air**.



Atmospheric envelope:

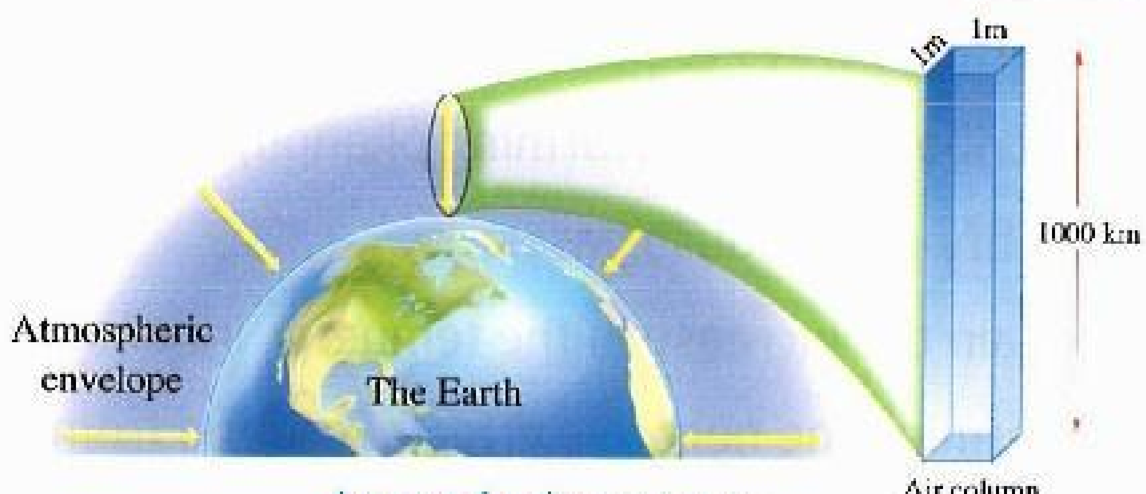
It is a gaseous envelope surrounding the Earth, that rotates with the Earth around its axis and extends for about 1000 km above sea level.

In this lesson we will study :

- *Atmospheric pressure.*
- *Layers of the atmospheric envelope.*

Atmospheric pressure

- We know that any matter has a mass, a volume and a weight, so the atmospheric envelope of the Earth has a weight known as the atmospheric pressure.



Atmospheric pressure

Atmospheric pressure:

It is the weight of air column of an atmospheric height on a unit area ($1m^2$).

The atmospheric pressure is measured by a unit called **a bar** or **a millibar**.

1 bar (b) = 1000 millibar (mbar)

The atmospheric pressure at the sea level is known as **normal atmospheric pressure,** and it equals 1013.25 mbar .

Normal atmospheric pressure:

It is the atmospheric pressure at sea level.

Enrichment information

The internal pressure in the human body is equivalent to the external atmospheric pressure.

The change of atmospheric pressure with the change in height above sea level

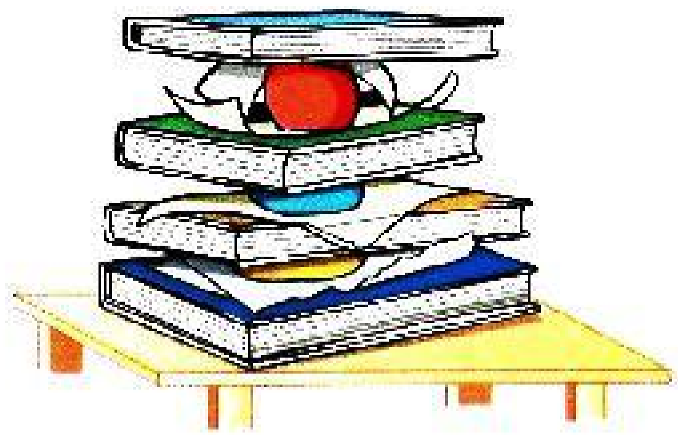
Activity **To show how atmospheric pressure changes by changing the height above sea level :**

Materials :



- 4 large books.
- 6 plastic sheets.
- 3 pieces of clay of different colours.

Steps :



1. Form 3 similar spheres of clay of different colours.
2. Put the clay spheres between plastic sheets and books (as shown in the figure).

Observations :

- The shapes of clay spheres change by the effect of the weight of the books on them.
- The change in the shape of lower clay sphere (yellow colour) is the maximum, due to increasing the pressure on it by the effect of the weight of the three books, while the change in the shape of higher clay sphere (red colour) is the minimum, due to decreasing the pressure on it by the effect of the weight of one book.

Conclusion:

The change in the shape of clay spheres increases by increasing the number of books (or height) due to the increase in their weights (or pressures), and vice versa.

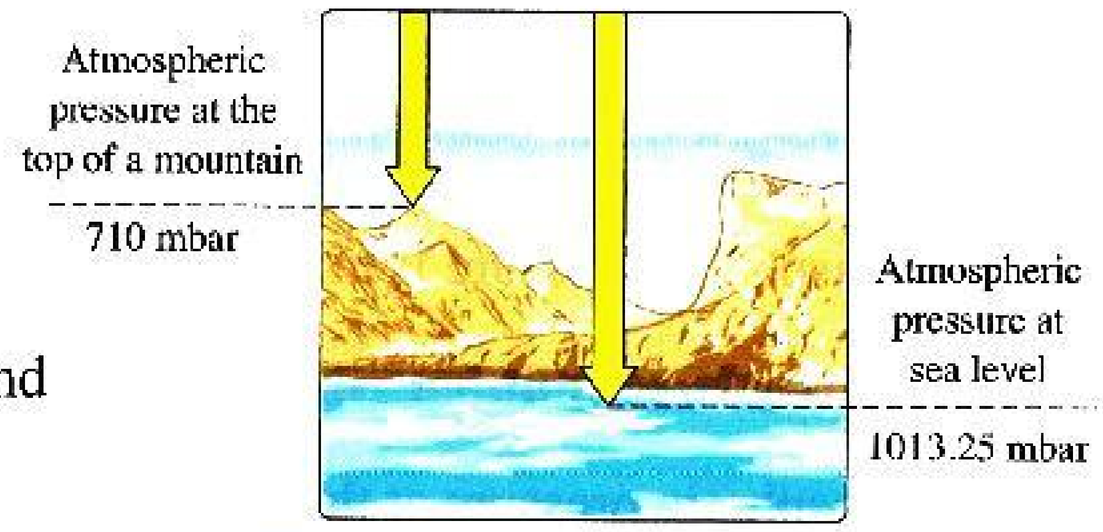
Similarly :

- **The atmospheric pressure decreases on going above the sea level G.R.**

  Due to decreasing the length of air column and thus its weight decreases.

- **The atmospheric pressure increases on going under the sea level G.R.**

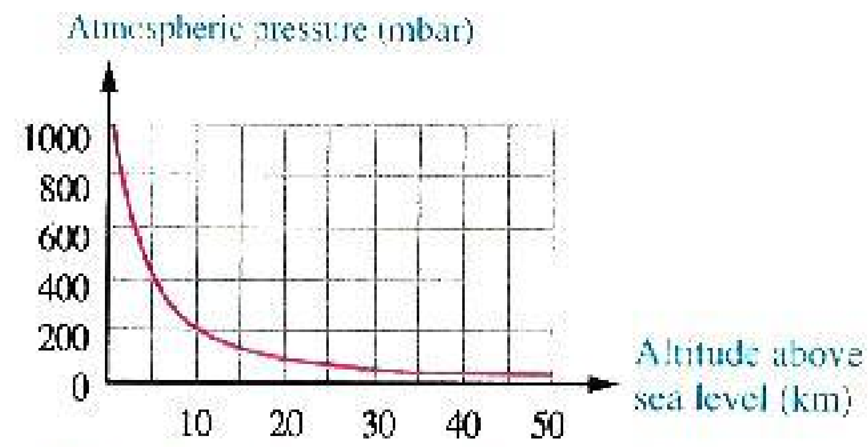
  Due to increasing the length of air column and thus its weight increases.



The atmospheric pressure decreases on going above sea level

G.R. ***The atmospheric pressure differs from an area to another on the Earth's surface.***

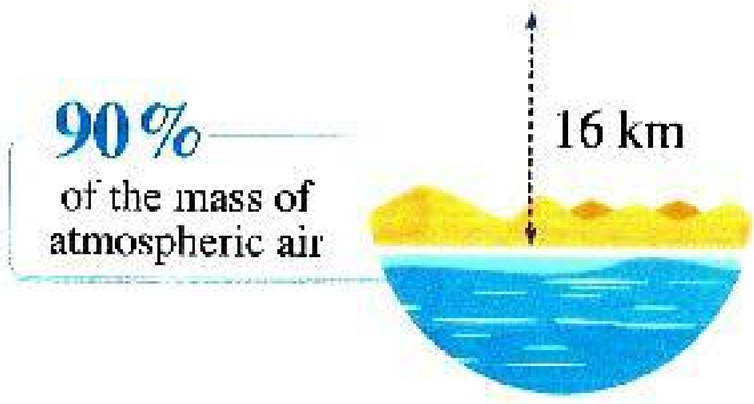
Due to the difference in the length of air column from an area to another on the Earth's surface.



The relation between the altitude (height) above sea level and the atmospheric pressure (Inverse relationship)

Notes

90 % of the mass of atmospheric air is present up to **16 km height** above the sea level.



50 % of the mass of atmospheric air is present up to **3 km height** above the sea level.



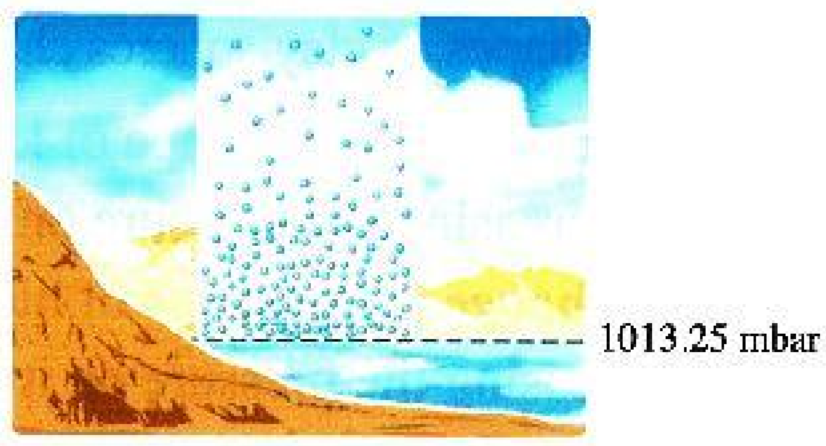
What happens to ...?

The density of air on going above sea level.

➲ The density of air decreases.

Note

Density of air at the top of a mountain is less than its density at the foot of the mountain



Density of air at the top and at the foot of the mountain

Exercise

Rearrange the values of atmospheric pressure according to the given arranged elevations above the sea level.

Elevation above sea level (km)	3	6	9	12
Atmospheric pressure (mbar)	203	731	323	503

Answer

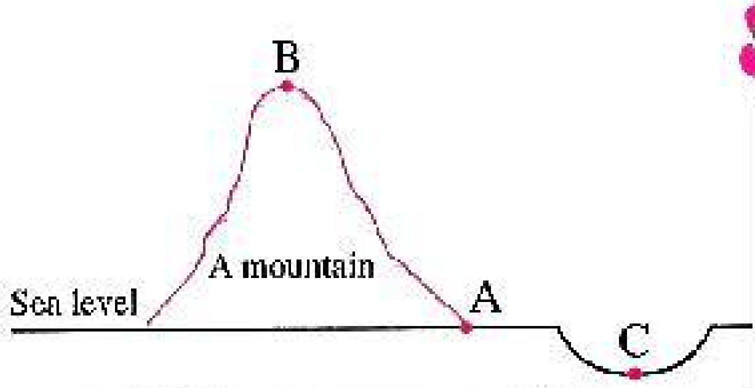
Elevation above sea level (km)	3	6	9	12
Atmospheric pressure (mbar)	731	503	323	203

Question

From the opposite figure, at which points :

1. Atmospheric pressure is the maximum.
2. Air density is the minimum.

"*Give an explanation at each case*"



The instruments of measuring the atmospheric pressure

- The atmospheric pressure is measured by instruments called **barometers** which are shown in the following table :

Instrument	Figure	Importance
Aneroid		It is used to determine the possible day weather based on the atmospheric pressure.
Altimeter	 Analog Altimeter  Digital Altimeter	It is used in aeroplanes to measure the elevation of navigation based on the atmospheric pressure.

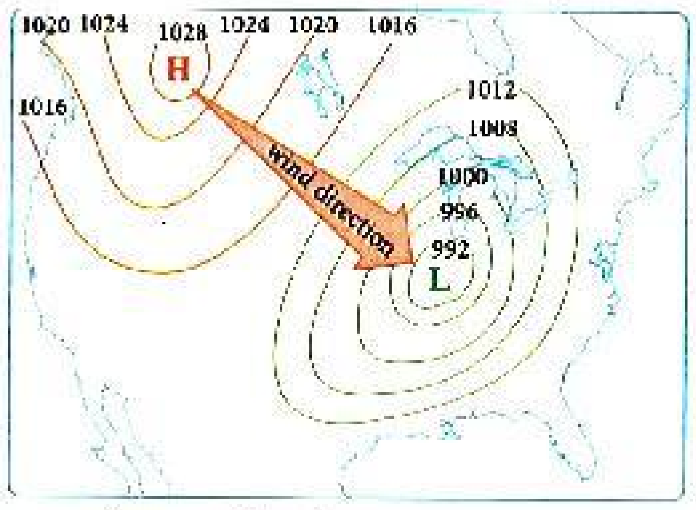
Enrichment information

The greatest atmospheric pressure could be recorded on the surface of the Earth in January, 1968 in Siyberia and it was 1080 mbar,

whereas the lowest atmospheric pressure was in the centre of the tropical hurricane "Typhoon" in 1979 and it was 870 mbar.

Atmospheric pressure maps

In atmospheric pressure maps, points of **equal pressure** are joined by curved lines known as **Isobar**.



Atmospheric pressure map

Isobar :

Curved lines that join the points of equal pressure in atmospheric pressure maps.

- The centre of **high** atmospheric pressure areas is represented by "H".
- The centre of **low** atmospheric pressure areas is represented by "L".

Importance

- The atmospheric pressure maps are used to detect the directions of winds as winds move from the areas of **high** atmospheric pressure to the areas of **low** atmospheric pressure.

G.R. ***Wind moves from an area to another on the Earth's surface.***

Due to the difference in atmospheric pressure from an area to another on the Earth's surface, where the wind moves from the areas of high atmospheric pressure to the areas of low atmospheric pressure.

Layers of the atmospheric envelope

The atmospheric envelope consists of four layers above sea level, which are classified according to :

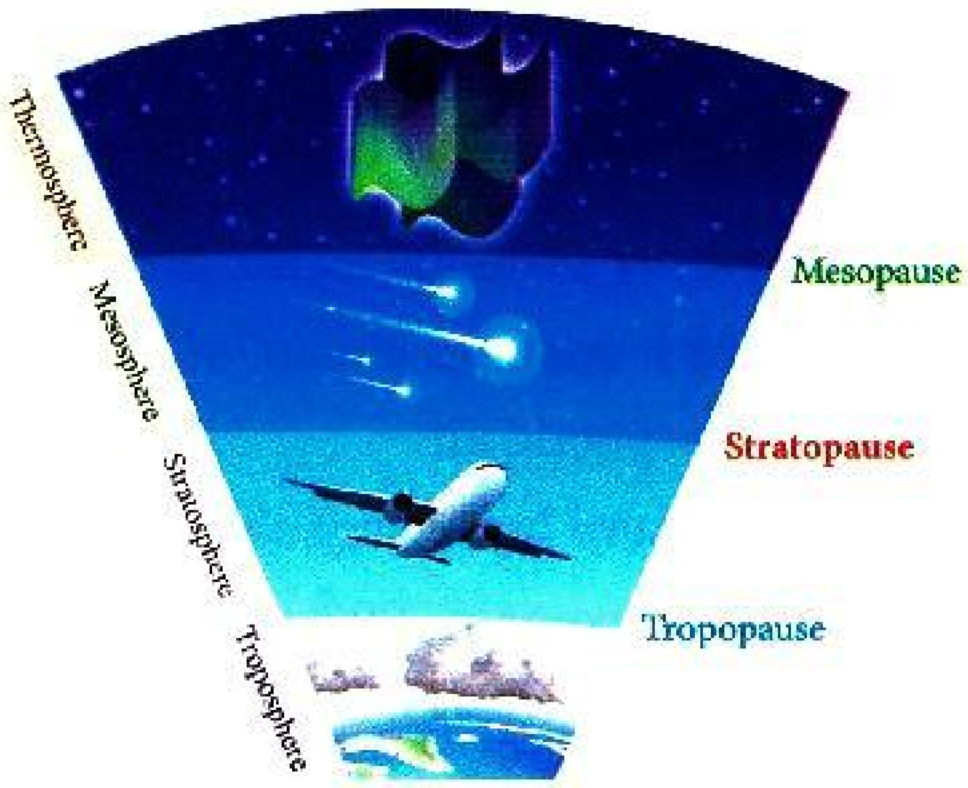
- ***The change in atmospheric pressure.***
- ***The change in temperature.***

Layers of the atmospheric envelope

1. Troposphere
2. Stratosphere
3. Mesosphere
4. Thermosphere

There is a region between each two successive layers. In these regions, temperature remains constant, these regions are:

1. **Tropopause** is the region between troposphere and stratosphere.
2. **Stratopause** is the region between stratosphere and mesosphere.
3. **Mesopause** is the region between mesosphere and thermosphere.



Layers of the atmospheric envelope

1 Troposphere

It means the disturbed layer G.R.

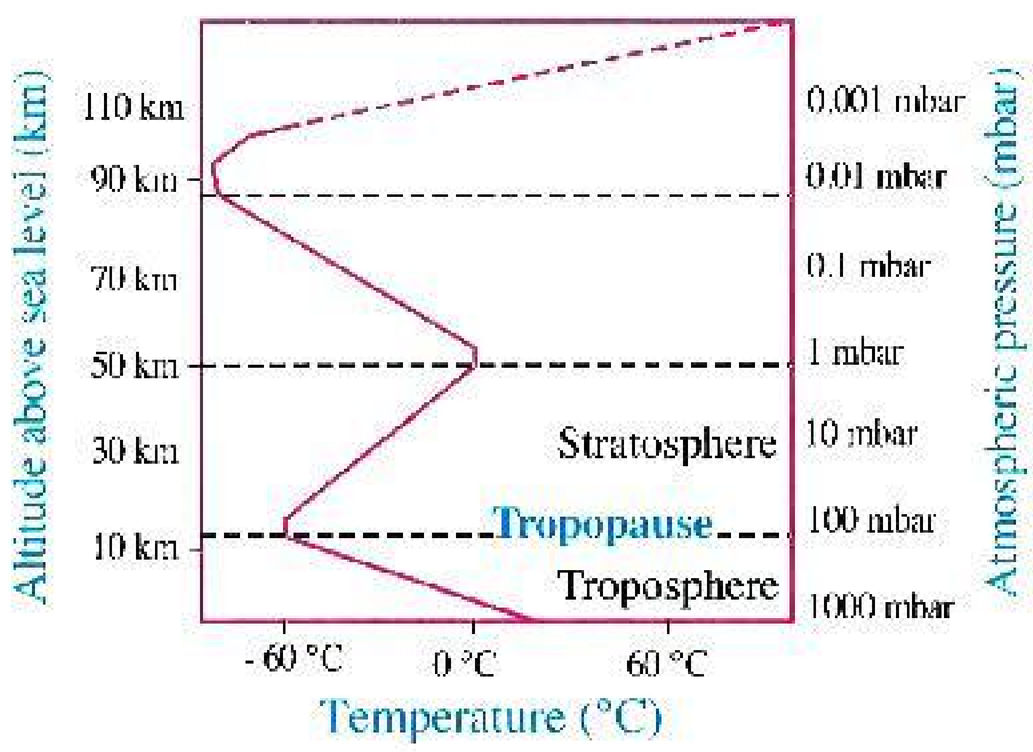
Because all atmospheric turbulences (weather changes) take place in it.

Location

It is the first layer of atmospheric envelope.

Characteristics (properties) and importance of troposphere layer :

Study the opposite figure to know the properties of troposphere layer :



Thickness

It extends for about **13 km** above sea level to the tropopause (**i.e.** the thickness of troposphere layer is **13 kilometres**).

▸ Enrichment information

Troposphere thickness is about 8 km above the two poles and 18 km at the equator , so average troposphere thickness $= \frac{8 + 18}{2} = 13$ *km.*

Pressure

The atmospheric pressure in this layer **decreases** as we go up until it becomes 100 mbar nearly at its top (100 mbar = 0.1 bar , so the atmospheric pressure at its top is equal to 0.1 of the normal atmospheric pressure at the sea level).

Importance

- **All weather phenomena are present in troposphere layer G.R.**
  Because it contains about 75% of the total mass of the atmospheric air.
- **Troposphere layer organizes the Earth's temperature G.R.**
  Because it contains 99% of the total atmospheric water vapour.



Clouds and winds

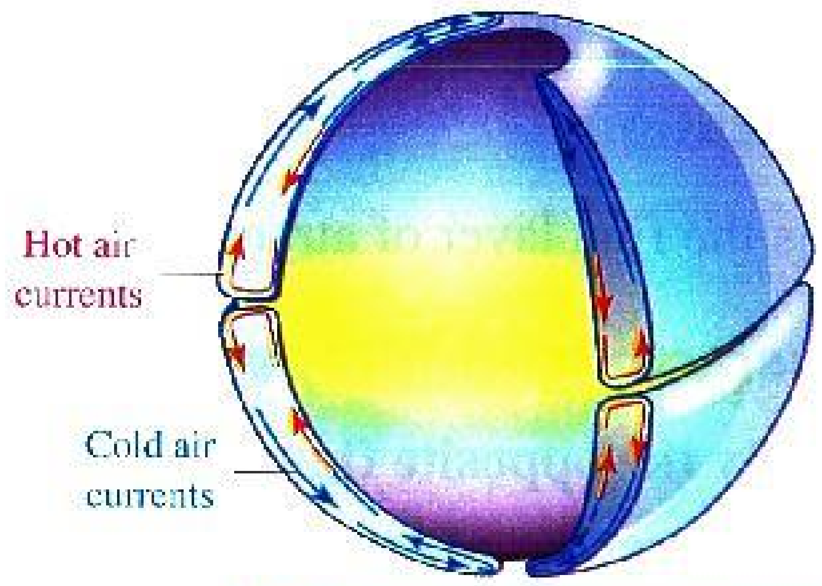
Note

Weather phenomena such as rains, wind, clouds, ... etc. take place in troposphere layer that form the weather conditions and consequently up the climate, that affect the activities of living organisms.

Air movement

The air movement in this layer is vertical G.R.

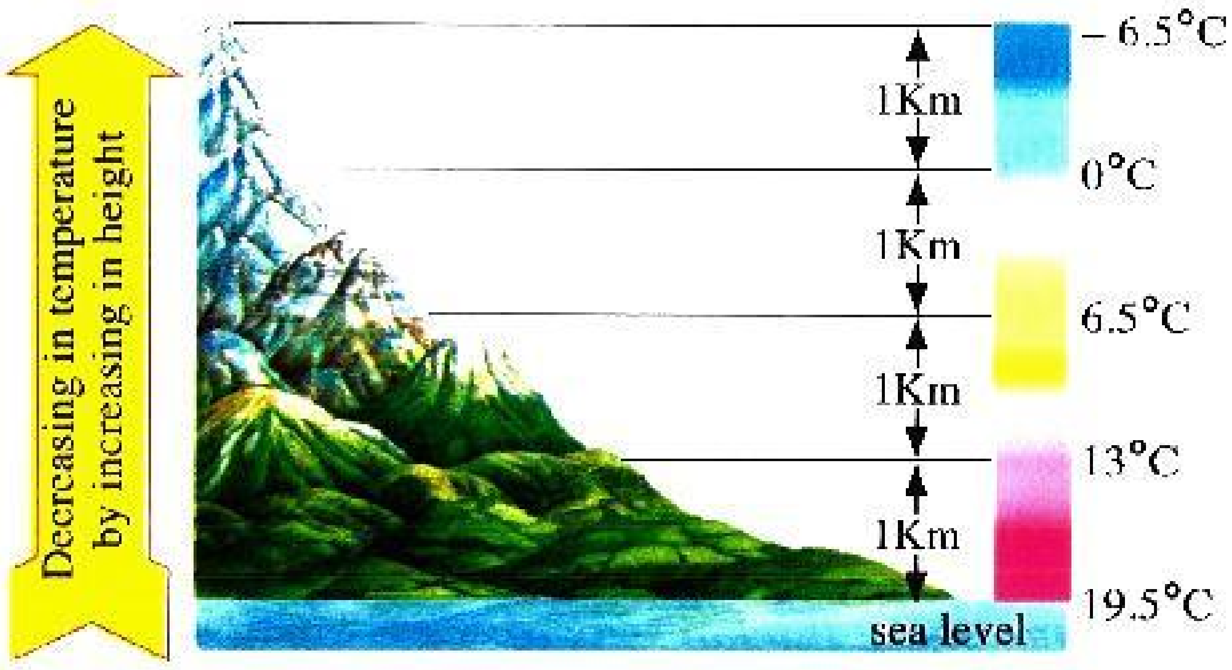
Because the hot air currents (of less density) move upwards, while cold air currents (of high density) move downwards.



The movement of air currents

Temperature

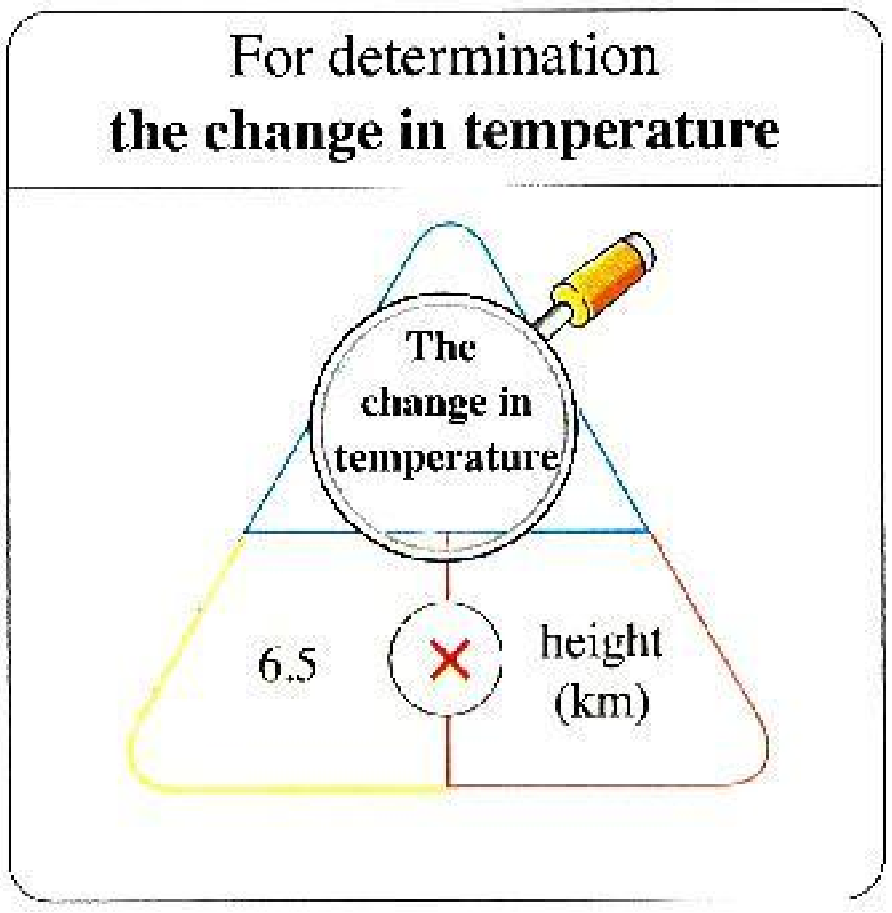
The temperature of this layer **decreases** at a rate **(6.5°C)** for each **(1 km)** height, until it reaches the lowest value of about **(– 60°C)** at tropopause.

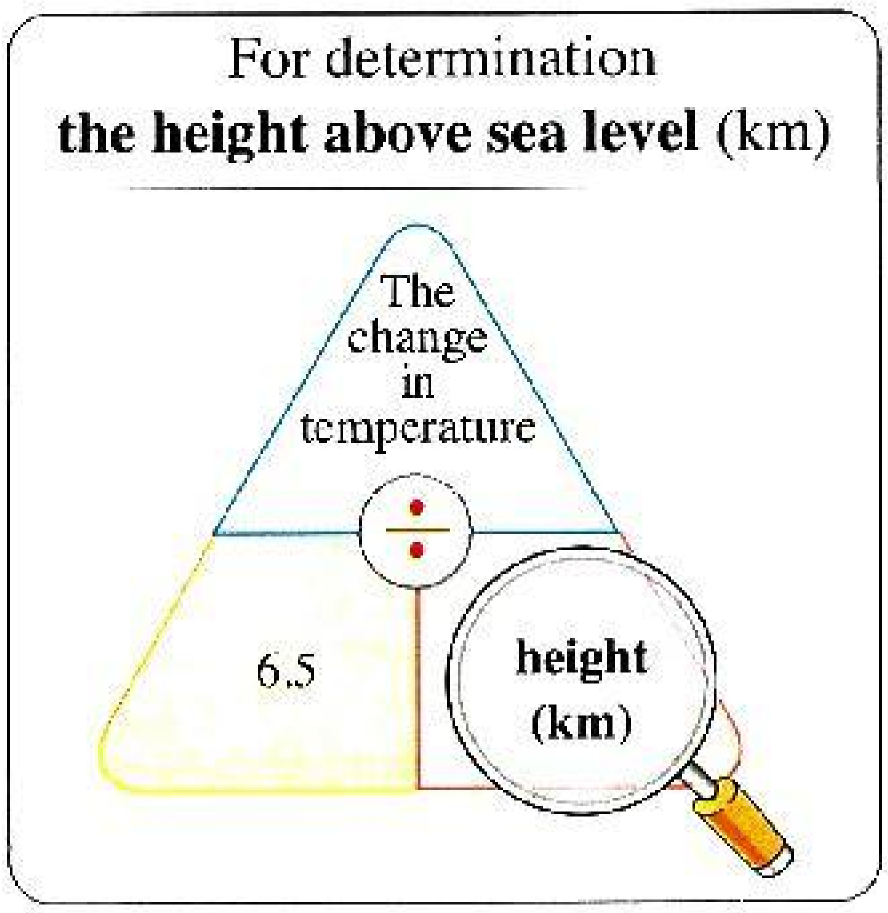


Decreasing in temperature by a rate 6.5°C for each 1 km height.

We can calculate the amount of change in the temperature in troposphere layer using the following relation :

The amount of change in temperature (decrease or increase) = **the height above sea level (km) × 6.5**





We can calculate the temperature at the top of a mountain or at its foot from the following relations :

The temperature at the top of a mountain = **the temperature at its foot − the amount of decrease in temperature**

The temperature at the foot of a mountain = **the temperature at its top + the amount of increase in temperature**

Example

If the temperature at the foot of Everest mountain is 20.6°C, find the temperature at its top of height 8862 m above the sea level.

Solution

- Height in kilometres = 8862 ÷ 1000 = 8.862 km
- The amount of decrease in temp. = the height above sea level (km) × 6.5
  = 8.862 × 6.5 = 57.6°C
- Temperature at the top of the mountain = temp. at its foot − the amount of decrease in temp.
  = 20.6 − 57.6 = − 37°C

We can calculate the amount of change in the temperature by knowing the temperature at the top and the foot of a mountain from the following relation :

The amount of change in temperature = **temperature at the foot of the mountain − temperature at the top of the mountain**

Example

Calculate the hight of a mountain, if you know that the temperature at it's foot is 20°C and at it's top is –6°C.

Solution

- The amount of change in temperature = temperature at its foot – temperature at its top

$$= 20 - (-6) = 26°C$$

- The height of the mountain $= \frac{\text{the amount of change in temp.}}{6.5} = \frac{26}{6.5} = 4 \text{ km}$

Example

From the opposite figure, calculate :

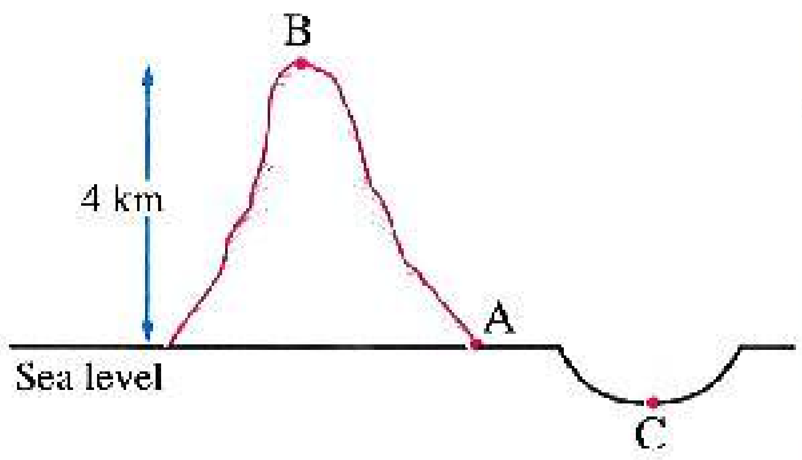
(1) The temperature at point (A)

(2) The vertical distance between point (B) and point (C).

If you know that :

- The temperature at point (B) = – 5°C

- The temperature at point (C) = 27.5°C



Solution

1. The amount of increase in temp. (B : A) = the height above sea level (km) × 6.5

$$= 4 \times 6.5 = 26°C$$

The temp. at point (A) = the temp. at point (B) + the amount of increase in temp.

$$= (-5) + 26 = 21°C$$

2. ∵ The amount of change in temp. (C : B) = the temp. at point (C) – the temp. at point (B)

$$= 27.5 - (-5) = 32.5°C$$

∴ The vertical distance between point (B) and point (C)

$$= \frac{\text{the amount of change in temp.}}{6.5} = \frac{32.5}{6.5} = 5 \text{ km}$$

TRY to answer worksheet **12** in the Notebook

2 Stratosphere

It is called the ozonic atmospheric envelope. G.R.

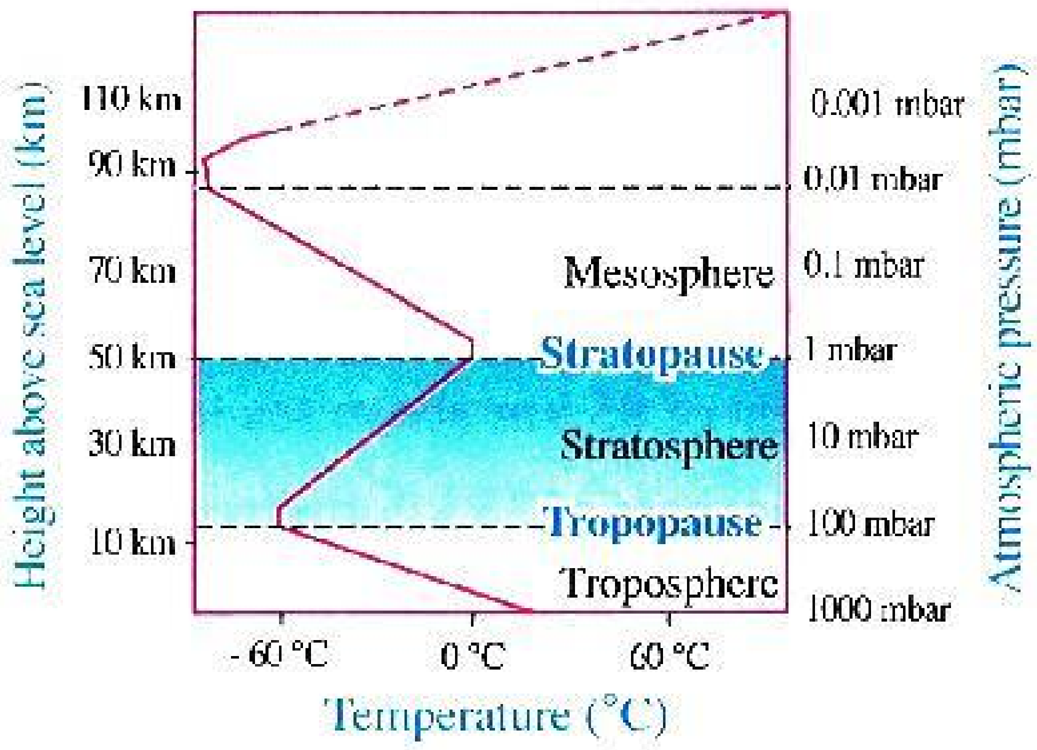
Because it contains most of ozone gas (O_3).

Location

It is the second layer of atmospheric envelope.

Characteristics and importance of stratosphere layer :

Study the opposite figure to know the properties of stratosphere layer :



Thickness

It extends from tropopause (at a height of **13 km** above sea level) to stratopause (at a height of **50 km** above sea level), with a thickness of **37 kilometres**.

Pressure

The atmospheric pressure in this layer **decreases** as we go up until it becomes 1 mbar at its top (1 mbar = 0.001 bar so, the atmospheric pressure at its top is equal to 0.001 of the normal atmospheric pressure at the sea level).

Importance

It contains most of ozone gas (O_3), which extends from 20 km to 40 km height above sea level , so it is called **the ozonic atmospheric envelope**.

Air movement

The lower part of this layer does not contain clouds or weather disturbances and the air movement is **horizontal,** so pilots prefer to fly their planes in the lower part of this layer.



Flying in stratosphere

Temperature

At the lower part, the temperature is constant and measure (– 60°C), then increases gradually until it reaches (0°C) at the top of the layer G.R.

This is due to the absorption of ultraviolet rays (emitted from the Sun) by ozone layer which is present at the upper part of this layer.

3 Mesosphere

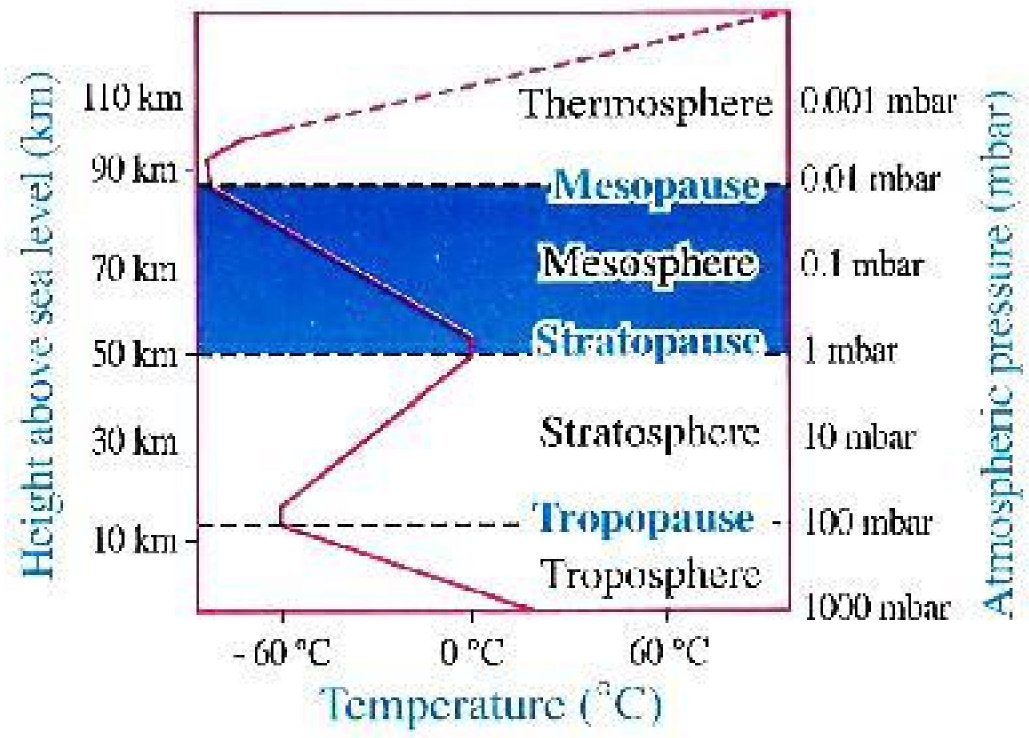
It is the middle layer, so it called mesosphere (**meso** means **middle**).

Location

It is the third layer of atmospheric envelope.

Characteristics and importance of mesosphere layer :

Study the opposite figure to know the properties of mesosphere layer :



Thickness

It extends from stratopause (at a height of **50 km** above sea level) to mesopause (at a height of **85 km** above sea level), with a thickness of **35 kilometres**.

Pressure

The atmospheric pressure in this layer **decreases** as we go up, until it becomes **0.01 mbar** at its top.

Importance

It protects the planet Earth from celestial rocky masses that enter the atmospheric envelope of Earth, where some of them burn completely as a result of their friction with air molecules forming luminous meteors.



Formation of luminous meteors in mesosphere

G.R. ***Mesosphere layer is much vacuumed (highly rarefied).***
Because it contains a limited amount of helium and hydrogen gases only.

Temperature

Mesosphere is considered the coldest layer G.R.
Because the temperature in this layer decreases at a high rate as we go up until it reaches (– 90°C) at its top.

▸ Enrichment information

Although meteors are burnt in mesosphere layer, spaceships don't burn during passing through it because their conical fronts disperse the heat and their tails are made of an insulated material.

4 Thermosphere

It is called the thermal layer G.R.

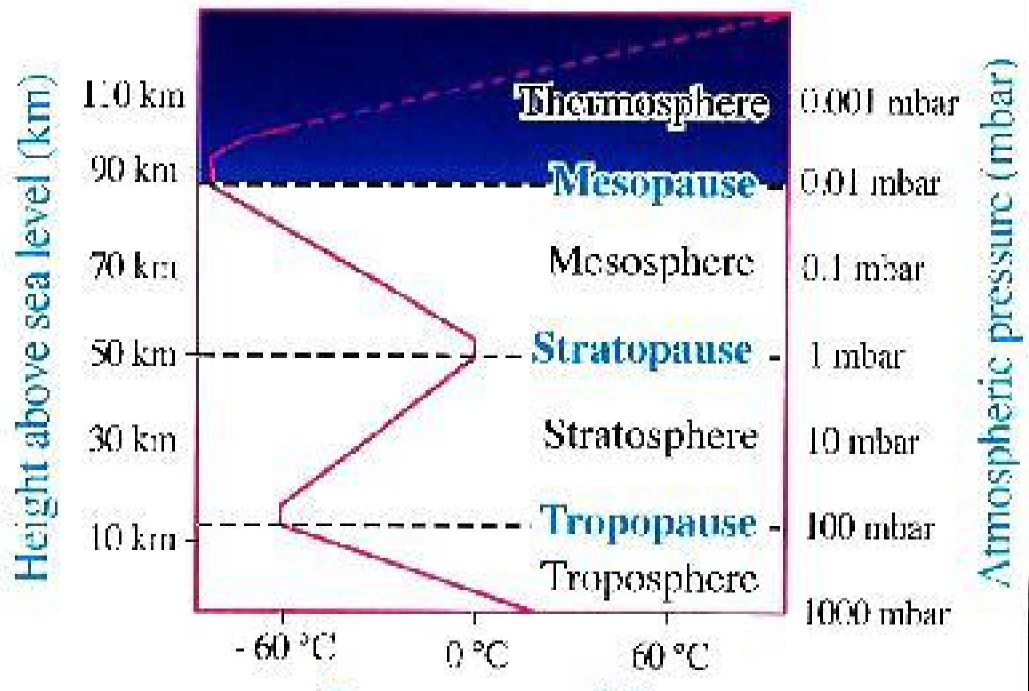
Because it is the hottest layer of atmospheric envelope.

Location

It is the fourth layer of atmospheric envelope.

Characteristics and importance of thermosphere layer :

Study the opposite figure to know the properties of thermosphere layer :



Thickness

It extends from mesopause (at a height of **85 km** above sea level) to a height of **675 km** above sea level, with a thickness of **590 kilometres**.

Temperature

The temperature of this layer **increases** at a high rate as we go up until it reaches (**1200°C**) at its top , so it is called the thermal layer.

G.R. ***The upper part of thermosphere layer is called ionosphere.***

Because it contains charged ions.

Ionosphere layer

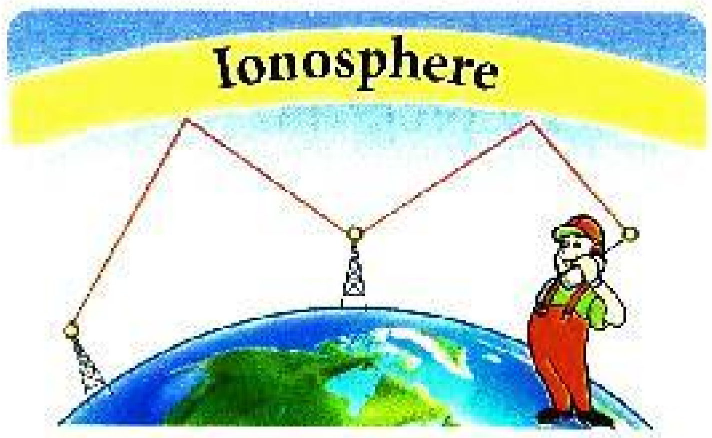
Ionosphere layer:

It is a layer that contains charged ions and it exists in the upper part of thermosphere and extends up to 700 km above sea level.

Importance

It is very important in wireless communications and broadcasting G.R.

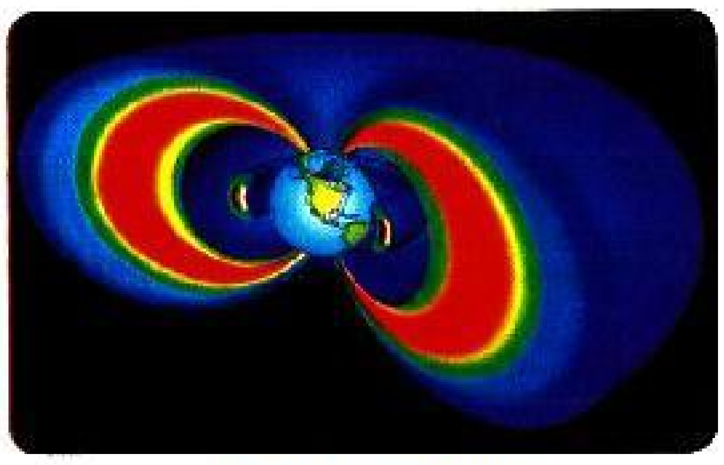
Because it reflects radio waves transmitted by radio stations and communication centres.



Reflection of radio waves from ionosphere

Van-Allen Belts

Ionosphere is surrounded by two magnetic belts known as **Van-Allen Belts** which is related to the scientist Van-Allen who discovered them.



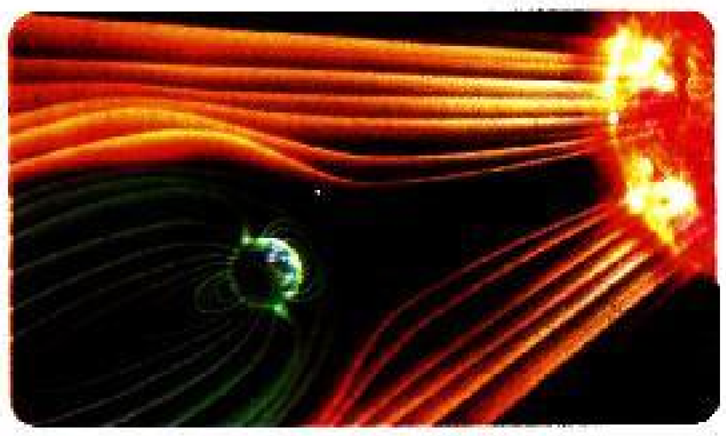
Van-Allen Belts

Van-Allen Belts:

They are two magnetic belts surrounding ionosphere.

Importance

These belts play an important role in scattering of harmful charged cosmic radiations away from the Earth which cause the occurrence of **Aurora phenomenon**.



Scattering of harmful charged cosmic radiations away from the Earth

Aurora phenomenon:

It is a phenomenon that appears as brightly coloured light curtains seen at both the north and south poles of the Earth.



Aurora phenomenon

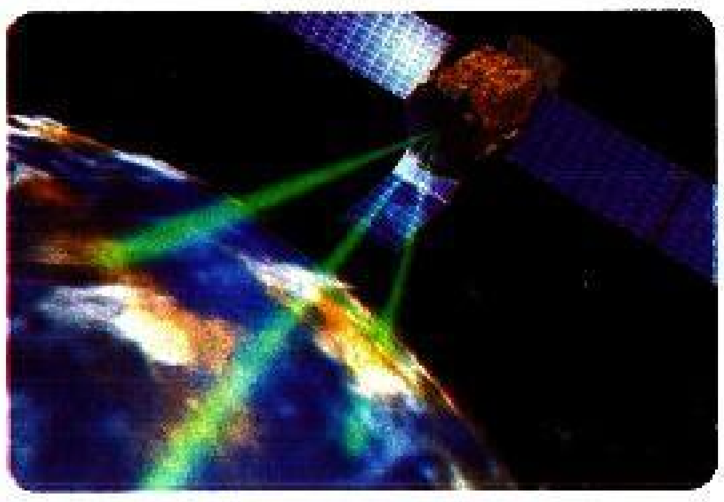
Exosphere layer

Exosphere:

It is a region in which the atmospheric envelope is inserted in outer space.

Importance

Satellites float in exosphere [around the Earth] are used to transmit weather condition information and TV programs.



Role of satellites in wireless communications

Enrichment information

The Egyptian satellite (Nile sat) transmits a number of different educational channels which you can watch through the digital space channels.

TRY to answer worksheet 13 in the Notebook

Remember

Lesson One

✪ Atmospheric envelope :

It is a gaseous envelope surrounding the Earth that rotates with the Earth around its axis and it extends for about 1000 km above sea level.

✪ Atmospheric pressure :

It is the weight of air column of an atmospheric height on a unit area ($1 m^2$).

✪ Normal atmospheric pressure :

It is the atmospheric pressure at sea level which equals 1013.15 mbar.

- 50 % of the mass of atmospheric air is present up to 3 km height above the sea level.
- 90 % of the mass of atmospheric air is present up to 16 km height above the sea level.

✪ The instruments of measuring the atmospheric pressure :

- The atmospheric pressure is measured by instruments called barometers.
- Among the most famous types of barometers are aneroid and altimeter.
- **Aneroid** is used to determine the possible day weather.
- **Altimeter** is used in aeroplanes to measure the elevation of navigation.

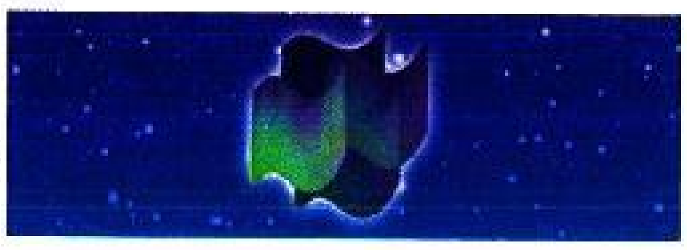
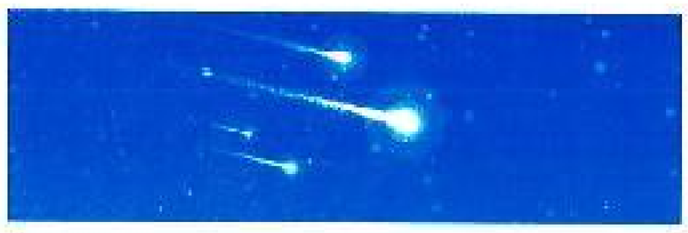
✪ Isobar :

Curved lines that join the points of equal pressure in atmospheric pressure maps.

- Wind moves from the areas of high atmospheric pressure to the areas of low atmospheric pressure.

✪ Atmospheric layers :

- We can classify the atmospheric envelope into four layers according to :
  * The change in atmospheric pressure.
  * The change in temperature.

Altitude	Layer	Characteristics	At its top
675 Km – 85 Km	**Thermosphere** (590 Km)	- The hottest layer. - Its upper part contains charged ions which extends up to 700 km above the sea level, therefore this part is known as ionosphere. **Ionosphere :** - It is very important in wireless communications and broadcasting.  - It is surrounded by two magnetic belts known as **Van-Allen Belts**.	**at its top** **Temperature:** (1200°C) **Atmospheric pressure:** (0.001 mbar)
85 Km – 50 Km	**Mesosphere** (35 Km)	- The coldest layer. - It contains a limited amount of helium and hydrogen gases only, so it is much vacuumed (highly rarefied).  - It protects the planet Earth from celestial rocky masses that enter the atmospheric envelope of Earth.	**at its top** **Temperature:** (– 90°C) **Atmospheric pressure:** (0.01mbar)
50 Km – 13 Km	**Stratosphere** (37 Km)	- It is called the ozonic atmospheric envelope. - It contains most of ozone gas which extends from 20 km to 40 km above sea level.  - Pilots prefer to fly their planes in this layer. - Air movement in this layer is horizontal.	**at its top** **Temperature:** (0°C) **Atmospheric pressure:** (1mbar)
13 Km – Sea level	**Troposphere** (13 km)	- It means the disturbed layer. - It contains : ∗ About 75% of the mass of the atmospheric air. ∗ 99% of atmospheric water vapour.  - Air movement in this layer is vertical.	**at its top** **Temperature:** (– 60°C) **Atmospheric pressure:** (100 mbar)

✪ Van-Allen Belts :

They are two magnetic belts surrounding ionosphere and play an important role in scattering harmful charged cosmic radiations.

Questions ? on lesson One

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. The height of atmospheric envelope is about .... above sea level.
   a. 1000 km b. 1000 m c. 1000 mbar d. 13 km
2. Atmospheric pressure is the .... of air column of an atmospheric height on a unit area.
   a. mass b. volume c. weight d. density
3. The measuring unit of atmospheric pressure is ....
   a. bar. b. Newton. c. millimetre. d. millilitre.
4. A device that is used in measuring the atmospheric pressure is ....
   a. barometer. b. voltmeter. c. ammeter. d. speedometer.
5. 📖 The normal atmospheric pressure equals .... mbar at sea level.
   a. 76 b. 1013.25 c. 1.013 d. 760
6. As the density of air increases, the atmospheric pressure ....
   a. increases. b. decreases. c. doesn't change. d. doesn't affect.
7. .... is an instrument used by pilots in aeroplanes to measure their elevation above sea level based on atmospheric pressure.
   a. Altimeter b. Thermometer c. Aneroid d. Digital balance
8. The amount of change in the temperature at any height in troposphere is given by ....
   a. height in metres × 6.5 b. height in km + 6.5
   c. height in km × 6.5 d. height in km ÷ 6.5
9. Temperature decreases by .... at 2 km above sea level.
   a. 6.5°C b. 13°C c. 5.6°C d. 9.75°C
10. All the atmospheric phenomena on the Earth like rains, winds and clouds take place in .... layer.
    a. mesosphere b. stratosphere c. thermosphere d. troposphere
11. Water vapour in troposphere .... the temperature on the Earth.
    a. organizes b. decreases c. increases d. has no effect on
12. .... is the second layer of atmospheric envelope.
    a. Thermosphere b. Stratosphere c. Troposphere d. Mesosphere
13. 📖 .... is located between stratosphere and mesosphere.
    a. Thermopause b. Mesopause c. Stratopause d. Tropopause

14. Ozone layer is found in .... layer.
    a. troposphere b. stratosphere c. mesosphere d. thermosphere
15. The air moves .... in the stratosphere layer.
    a. horizontally b. vertically
    c. inclined d. randomly
16. Pilots prefer to fly their planes in the lower part of ...., because there are no weather disturbance and air moves horizontally.
    a. thermosphere b. mesosphere
    c. troposphere d. stratosphere
17. The coldest atmospheric layer in the atmospheric envelope is ....
    a. troposphere. b. stratosphere. c. mesosphere. d. thermosphere.
18. The thickness of mesosphere layer is .... km.
    a. 1000 b. 13 c. 590 d. 35
19. The temperature at the top of mesosphere layer reaches ....
    a. 76°C b. – 90°C c. – 60°C d. 1200°C
20. The .... layer is much vacuumed layer.
    a. troposphere b. stratosphere c. mesosphere d. thermosphere
21. Meteors are formed in .... layer.
    a. ionosphere b. stratosphere c. mesosphere d. exosphere
22. The hottest atmospheric layer in atmospheric envelope is ....
    a. troposphere. b. stratosphere. c. thermosphere. d. mesosphere.
23. Ionosphere layer is surrounded by two .... belts.
    a. electric b. ionic c. magnetic d. thermal
24. Ionosphere layer is located in the upper part of .... layer.
    a. stratosphere b. troposphere c. mesosphere d. thermosphere
25. The charged cosmic radiations are dispersed in the .... layer.
    a. troposphere b. stratosphere c. mesosphere d. ionosphere

2. Choose from column (B) what suits it in column (A) :

(1)

(A)	(B)
1. Troposphere	a. the coldest layer in atmospheric envelope.
2. Mesosphere	b. the layer that is suitable for flying aeroplanes.
3. Stratosphere	c. an instrument used to measure atmospheric pressure.
4. Thermosphere	d. the layer that contains all weather phenomena.
	e. the hottest layer in atmospheric envelope.

(2)

(A)	(B)
1. Mesopause	a. is the region between thermosphere and the outer space.
2. Tropopause	b. is the region between mesosphere and thermosphere.
3. Stratopause	c. is the region between stratosphere and mesosphere.
4. Exosphere	d. is the region between troposphere and stratosphere.
	e. its thickness is about 13 km above the sea level.

3. Put (✓) in front of correct statements and (x) in front of incorrect ones, then correct them :

1. The atmospheric envelope rotates with the Earth around its axis. ( )
2. The atmospheric pressure is the mass of air column above a unit area. ( )
3. 50 % of the mass of the atmospheric envelope is present in the area between the sea level and 3 km height. ( )
4. The atmospheric pressure decreases on going above sea level. ( )
5. The density of air increases as we go up. ( )
6. Altimeter is an instrument used to determine the elevation of aeroplanes above sea level. ( )
7. Wind moves from regions of high atmospheric pressure to that of low atmospheric pressure. ( )
8. Troposphere is the first layer of atmospheric envelope. ( )
9. Stratopause is the region between stratosphere and troposphere. ( )
10. All weather phenomena like rains, winds and clouds take place in ionosphere layer. ( )
11. The thickness of troposphere layer is 37 kilometres. ( )
12. Mesosphere layer contains 99% of atmospheric water vapour which organizes the Earth's temperature. ( )
13. The atmospheric pressure in stratosphere layer increases as we go up until it becomes 0.001 bar. ( )
14. Pilots prefer to fly their aeroplanes in the upper part of mesosphere. ( )
15. Stratosphere is the third layer in the atmospheric envelope. ( )
16. Ozone layer is found in thermosphere layer. ( )
17. Meteors are formed in mesosphere layer due to their friction with air molecules. ( )
18. Mesosphere is the coldest layer in the atmospheric envelope. ( )
19. The temperature of the fourth layer increases at a high rate as we go up until it reaches 1200°C at its top. ( )
20. The ionosphere is surrounded by two Van-Allen belts, which are responsible for scattering the harmful cosmic rays away from the Earth. ( )

21. Aurora phenomenon is considered as coloured brightly light curtains seen at north and south poles of the Earth. ( )
22. The atmospheric envelope is inserted in the outer space in a region known as ionosphere. ( )
23. Satellites revolve around the Earth in a region called the exosphere. ( )

4. Write the scientific term of each of the following :

1. The gaseous envelope which surrounds the Earth, and is rotating with it around its axis.
2. The weight of air column of an atmosphere height above a unit area.
3. The measuring unit of atmospheric pressure.
4. The atmospheric pressure at sea level.
5. The device used to measure the atmospheric pressure.
6. The barometer used to determine the possible day weather.
7. The barometer used by pilots in aeroplanes to measure their elevations above the sea level.
8. The curved lines that join the points of equal pressure in atmospheric pressure maps.
9. The region between troposphere and stratosphere layers.
10. 📖 The boundary separating between stratosphere and mesosphere where temperature is rather constant.
11. The region between mesosphere and thermosphere.
12. An atmospheric layer, in which air currents move vertically.
13. • The ozonic atmospheric envelope.
    • An atmospheric layer in which air moves horizontally.
    • The atmospheric layer, at which pilots prefer to fly.
14. • The coldest atmospheric layer.
    • The atmospheric layer, which contains a limited amount of hydrogen and helium gases only.
15. The hottest atmospheric layer.
16. 📖 A charged layer reflects radio waves.
17. Two magnetic belts that help in scattering of harmful cosmic radiations away from the Earth.
18. • The phenomenon that appears due to scattering of harmful charged radiations by Van-Allen Belts.
    • A phenomenon that appears as brightly coloured light curtains seen at the both poles of the Earth.
19. • The region in which the atmospheric envelope is inserted in outer space.
    • The region in which satellites orbit around the planet Earth.

5. Complete the following statements :

1. The Earth is surrounded by .... envelope known as ....
2. The atmospheric air of the Earth has a weight known as ....
3. Bar is the unit used to measure ....
4. 1 bar = ... millibar.
5. Normal atmospheric pressure equals .... mbar at the sea level.
6. .... is a type of barometers used to determine the possible day weather, while .... is the instrument used to measure the altitude of aeroplanes above sea level.
7. The atmospheric pressure .... by increasing the length of air column.
8. As we go up to the top of a mountain, the atmospheric pressure .... because the height of air column ....
9. 50% of the mass of atmospheric air is present in the area between sea level and .... km height, but .... % of its mass is present up to 16 km height.
10. The density of air at the top of a mountain is .... than the density of air at the sea level.
11. Wind moves from the areas of .... atmospheric pressure to that of .... atmospheric pressure.
12. The atmospheric envelope consists of .... layers which are .... , stratosphere, mesosphere and ....
13. The region between the first and the second layers is called .... , while .... is the region between the third and the fourth layers.
14. .... is the first layer of atmospheric envelope and its thickness is about ....
15. The temperature of the troposphere decreases at a rate .... °C for each .... height.
16. The atmospheric pressure at the top of troposphere layer equals .... and the temperature reaches the lowest value for about .... at its top.
17. Troposphere contains about .... % from atmospheric envelope mass and about .... % from atmospheric water vapour.
18. Air movement in troposphere is .... , where hot air currents move ...., while cold air currents move ....
19. The second atmospheric layer is .... , which is also called the .... layer.
20. Stratosphere extends with a thickness equals .... km.
21. In the lower part of stratosphere, temperature is constant at .... °C, then it increases gradually until it reaches .... °C at its top.
22. In the upper part of stratosphere , ... layer is found which absorbs .... rays emitted from the Sun.

23. The atmospheric pressure in stratosphere layer .... as we go up till it becomes .... of the normal pressure.
24. Pilots prefer to fly their aeroplanes in the .... part of stratosphere due to the absence of .... and turbulences.
25. Stratosphere contains most of .... gas, which is found in atmospheric envelope and it extends from .... to .... km above sea level.
26. The third layer in atmospheric envelope is .... , and its thickness is about ....
27. The temperature in mesosphere .... as we go up until it reaches .... at the top.
28. Mesosphere layer is highly rarefied, because it contains a limited amount of .... and .... gases only.
29. The fourth layer in atmospheric envelope is .... , which is also called .... layer, because it is the hottest layer in the atmospheric envelope.
30. The temperature of thermosphere layer .... as we go up until it reaches .... °C.
31. The upper part of thermosphere layer is called .... and it extends up to .... km above sea level.
32. 📖 The highest temperature layer in the atmosphere is .... and the least temperature one is ....
33. Ionosphere is surrounded by two magnetic belts known as .... Belts, which play an important role in scattering of harmful charged cosmic radiations away from the ....
34. Phenomenon of .... appears as brightly coloured light curtains seen at the two .... of the Earth.
35. 📖 Most of weather features occur in .... layer, whereas satellites rotate in the .... layer.

6. Complete the following table :

Atmospheric layer	Order	Thickness	Temperature at its top
1.	The second		....
2. Thermosphere			....
3.			– 90°C
4.		13 km	....

7. Give reasons for :

1. The atmospheric pressure decreases on going above the sea level.
2. The atmospheric pressure differs from an area to another on the Earth's surface.
3. Altimeter instrument is important for navigation.
4. Winds blowing from a region to another on the Earth's surface.

5. The troposphere layer is called by this name.
6. The temperature at the top of a mountain is less than that at its foot.
7. Rains, clouds and winds are present in troposphere layer.
8. Troposphere layer regulates the Earth's temperature.
9. The air motion in troposphere layer is vertical.
10. The stratosphere layer is called the ozonic atmospheric envelope.
11. Temperature reaches 0°C in the upper part of stratosphere layer.
12. • The lower part of stratosphere is suitable for flying aeroplanes.
    • Pilots prefer to fly their aeroplanes in stratosphere.
13. Mesosphere layer is called by this name.
14. Mesosphere is the coldest layer.
15. Mesosphere layer is highly rarefied.
16. Luminous meteors are formed in mesosphere layer.
17. The last layer of atmospheric envelope is called thermal layer.
18. The upper part of thermosphere layer is called ionosphere.
19. Ionosphere is important for radio stations.
20. Van-Allen Belts play an important role in protecting the Earth.
21. Occurrence of aurora phenomenon.

8. What is meant by ...?

1. Atmospheric envelope.
2. Atmospheric pressure.
3. Normal atmospheric pressure.
4. Isobar.
5. Tropopause.
6. Stratopause.
7. Mesopause.
8. Van-Allen Belts.
9. Aurora phenomenon.
10. Exosphere.
11. Ionosphere layer.

9. What's the importance of ...?

1. Barometers.
2. Altimeter.
3. Aneroid.
4. Isobar.
5. Troposphere layer.
6. The lower part of stratosphere.
7. Mesosphere layer.
8. Ionosphere layer.
9. Van-Allen Belts.
10. Satellites.
11. Exosphere region.

10. Mention the number representing each of the following :

1. The height of atmospheric envelope.
2. The normal atmospheric pressure.
3. The percentage of water vapour in troposphere layer.
4. The thickness of the stratosphere layer.
5. Temperature at the top of the stratosphere.
6. The thickness of ozone layer.
7. The atmospheric pressure at the top of the mesosphere layer.
8. Temperature at the top of the thermosphere.
9. The height, at which the charged ions are present in ionosphere.

11. What happens in the following cases ...?

1. Diving into the depths of the sea [concerning : the pressure on the diving person].
2. Ascending upwards in troposphere [concerning : the temperature and the atmospheric pressure].
3. Descending downwards in stratosphere [concerning : the temperature and the atmospheric pressure].
4. Friction of space rocky masses with air molecules in mesosphere.
5. Harmful cosmic radiations reach the ionosphere.

12. Compare between :

1. Altimeter and aneroid [concerning : their usage].
2. Troposphere and stratosphere layers.
3. Tropopause and stratopause [concerning : the place].
4. Ionosphere layer and exosphere layer [concerning : definition and importance].
5. Mesosphere and thermosphere.
[concerning : temperature, importance and air pressure].

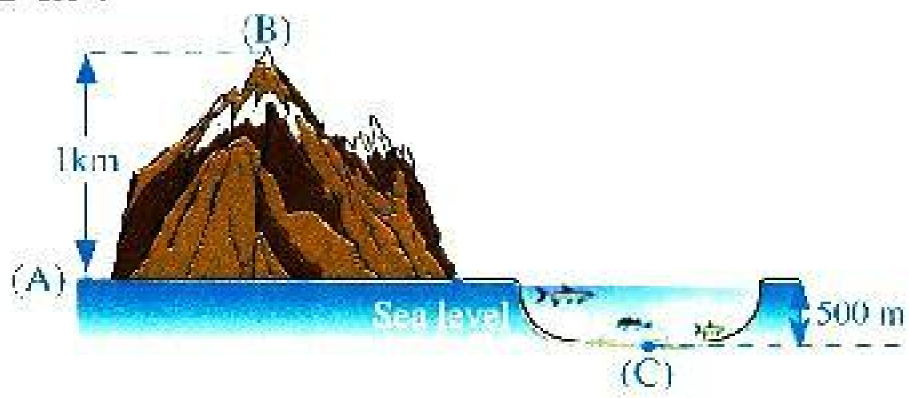
13. Problems :

1. Find the temperature at a point of height 10000 metres above sea level if the temperature at sea level is 24°C.
2. If the temperature at sea level is 24.5°C, find the temperature at the top of troposphere layer if its thickness is 13 kilometres.
3. Calculate the height of a mountain if the temperature at its foot is 30°C and at its top is (– 6°C).

4. From the opposite figure, calculate the temperature at :

   a. Point (B) if the temperature at point (A) = 26.5°C

   b. Point (C) if the temperature at point (B) becomes 10.25°C



14. Variant questions :

(1) Arrange the layers of atmospheric envelope descendingly according to the value of the atmospheric pressure.

(2) Arrange ascendingly the following measurements in a table containing the following :

- Altitude above sea level 9 km , 6 km , 3 km, 12 km
- Temperature at this height – 54°C , – 15°C, 4.5°C , – 34.5°C
- Atmospheric pressure 323 mb , 731 mb , 203 mb, 503 mb

(3) An aeroplane captain announced that the atmospheric pressure outside the aeroplane is 90 millibar.

In which layer of the atmosphere was the aeroplane flying ? Why ?

(4) Write brief notes on the relation between rising above the sea level and atmospheric pressure.

(5) In two regions on the Earth, we observe bright light curtains in the sky :

1. What is this phenomenon called ?
2. Why does this phenomenon happen ?
3. Where do we can see this phenomenon ?

15. Study the following figures, then answer the questions :

(1) Look at the opposite figures, then answer the following questions :

1. What is the name of each instrument ?
2. What is the importance of each one ?

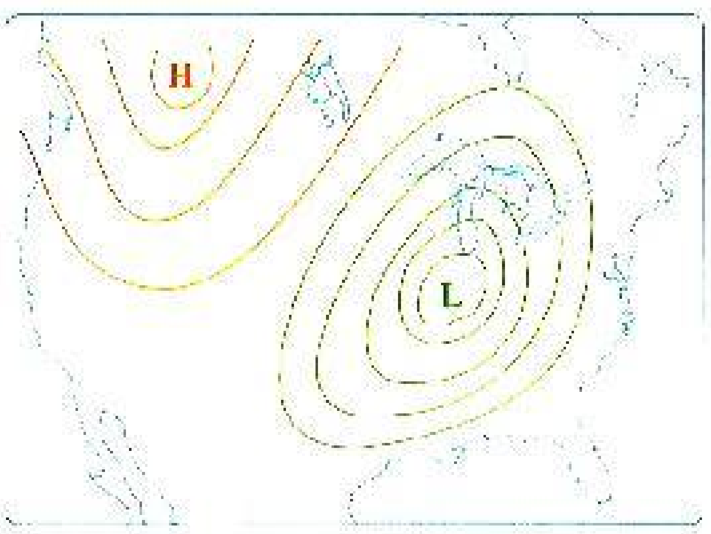

(a)



(b)

(2) The opposite figure represents the atmospheric pressure map. Answer the following questions :

1. The lines that are present on the map represent ....
2. The symbol "H" on the map represents ...., while the symbol "L" on the map represents ....
3. In which direction does the wind move ?



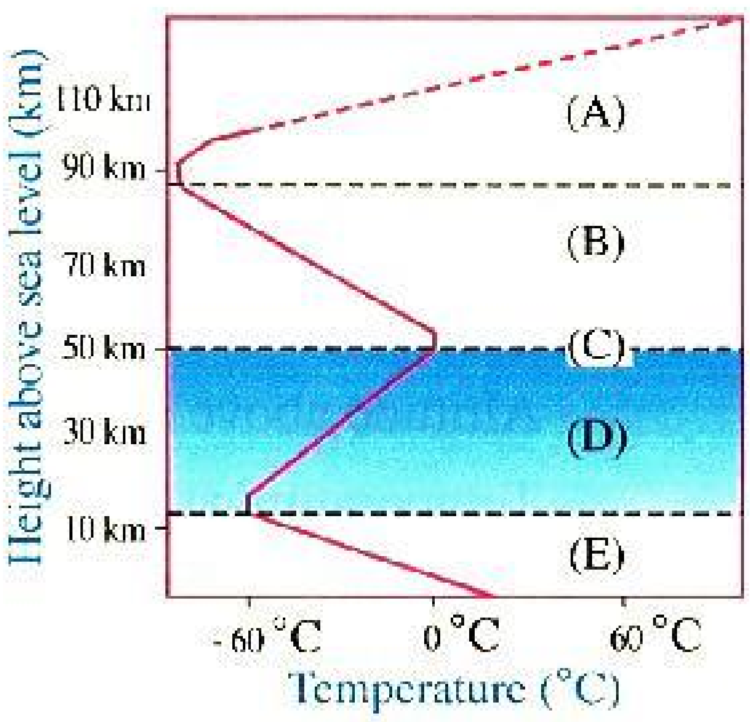
(3) From the opposite figure :

Calculate the height of the building if you know that the temperature which is recorded at the aeroplane = 3°C and the temperature which is recorded at the Earth's surface = 19.25°C.



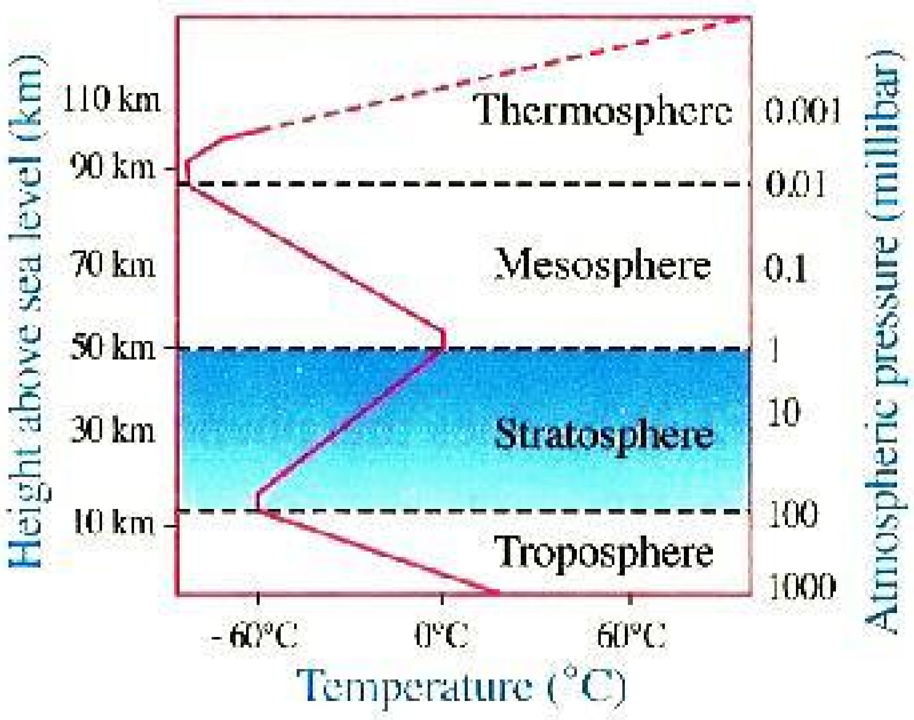
(4) The opposite figure exhibits the temperature changes in the layers of atmospheric envelope :

1. Replace the letters on the drawing with suitable labels.
2. Which layer is ....?
   a. The highest in temperature.
   b. The least in temperature.



(5) The opposite figure exhibits the temperature changes in the layers of atmospheric envelope :

1. Which of the atmospheric layers ....?
   a. is of the highest pressure.
   b. the atmospheric pressure at its end is 1 millibar.
2. Mention the highest and lowest temperature in :
   a. Stratosphere layer.
   b. Mesosphere layer.



(6) The opposite figure represents the two magnetic belts that surround the Earth planet :

a. 1. What is their scientific name ?
   2. Where are they located ?

b. What is the phenomenon that takes place as a result of their existence ?



Thinking Skills Questions

1. Choose the correct answer :

1. .... of the mass of air is located in a region extends between 3 km and 16 km height.
   a. 10 % b. 40 % c. 50 % d. 90 %

2. The total mass of the air which is located in the upper three layers of the atmospheric envelope is about ....
   a. 99 % b. 75 % c. 50 % d. 25 %

3. Molecules of air are most close to each other at ....
   a. sea surface. b. 1 km height. c. 3 km height. d. 16 km height.

4. In the lower part of the .... layer, more than half of the mass of the air is located.
   a. thermosphere b. troposphere c. mesosphere d. stratosphere

5. The upper three layers of atmospheric envelope contain .... of total atmospheric water vapour.
   a. 1 % b. 25 % c. 75 % d. 99 %

2. What happens when ... ?

a. Atmospheric pressure becomes equal at all areas of the Earth.

b. Ionosphere doesn't contain charged particles.

3. If the temperature at the foot of a mountain is 26°C, at which height the snow begins to appear.

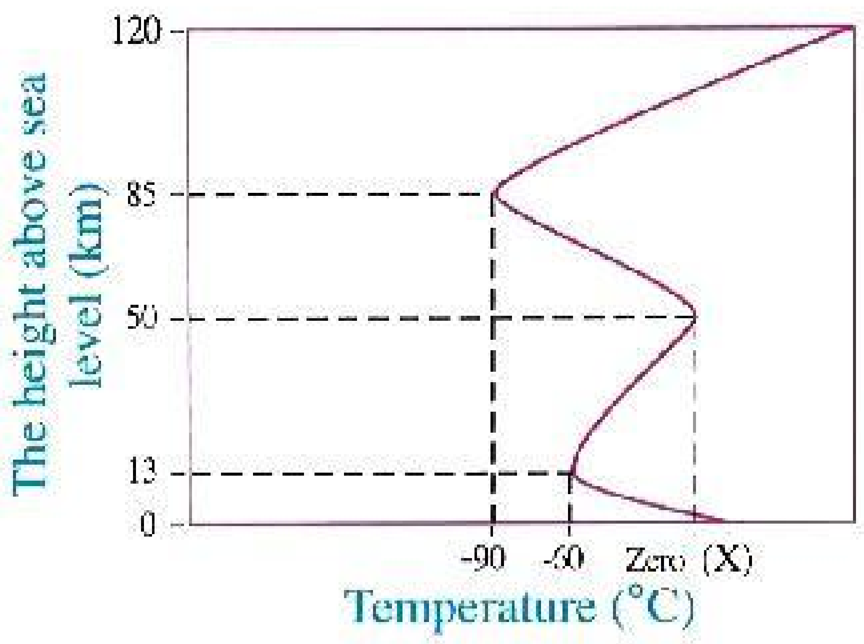
4. Calculate the difference in temperature between 2 points (A and B) if their heights above the sea surface is 8 and 10 km respectively.

5. If the temperature at the sea level = 24.5°C, calculate the temperature at a point located below tropopause by 5 km.

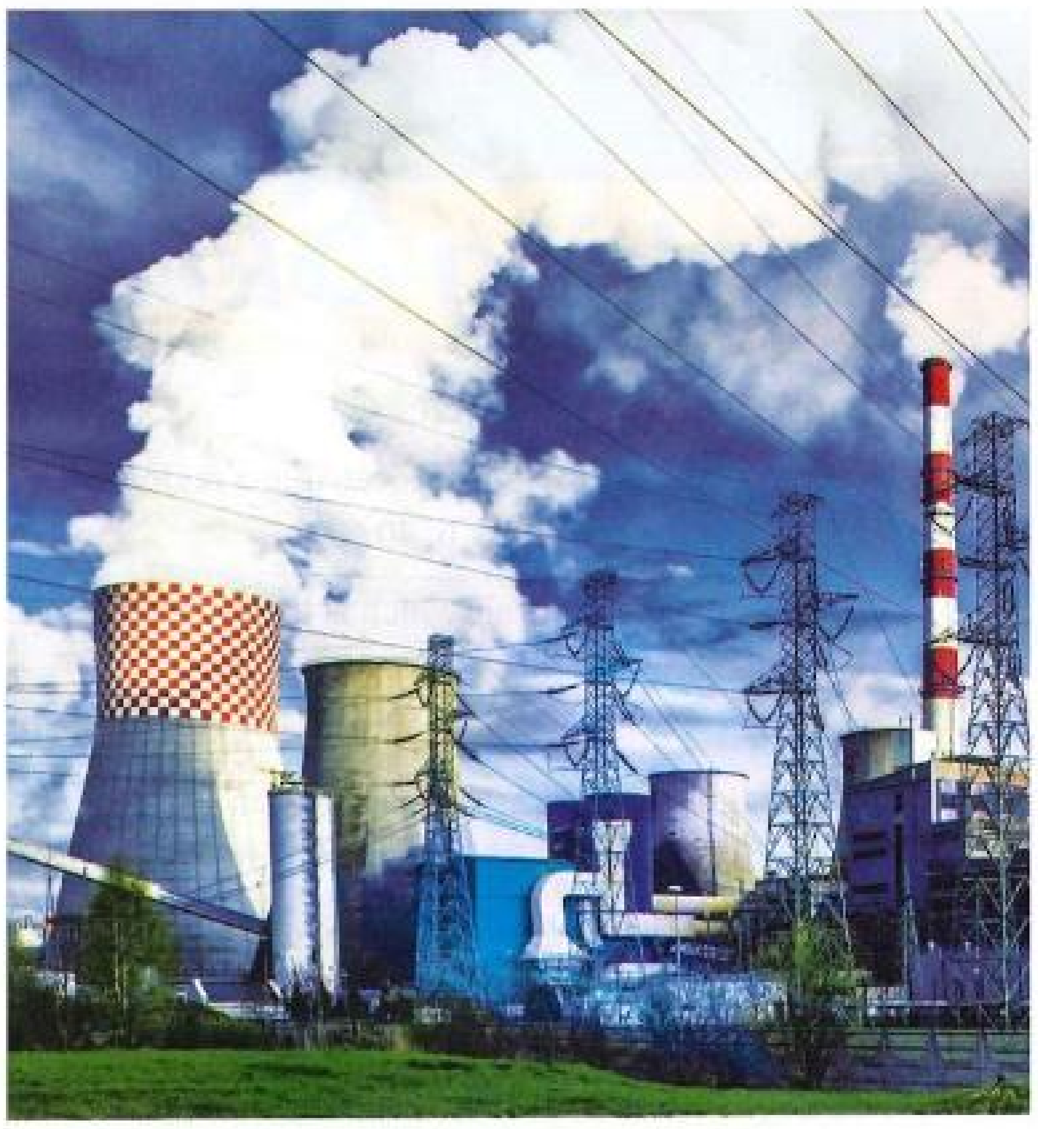
6. From the opposite figure :

(a) Calculate the difference in temperature from the beginning of mesosphere layer to its end.

(b) What is the expected temperature (X) ? Explain your answer.



Lesson 2



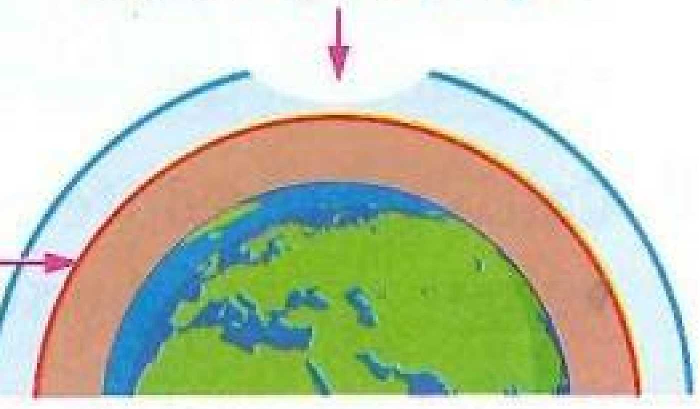
Erosion of Ozone Layer and Global warming

What are the dangers of the industrial development on our life?

There are two dangerous phenomena that have faced the Earth since the mid twentieth (20^{th}) century. These two phenomena are :

First : Erosion of ozone layer phenomenon (occurs in stratosphere).

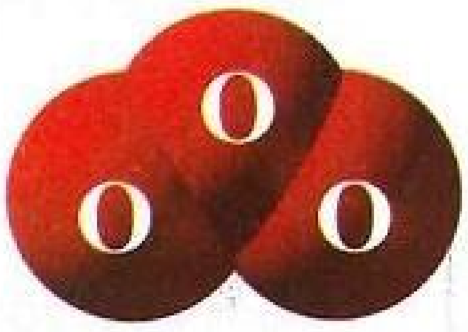
Second : Global warming phenomenon (occurs in troposphere).



FIRST Erosion of Ozone Layer phenomenon

Structure of ozone layer

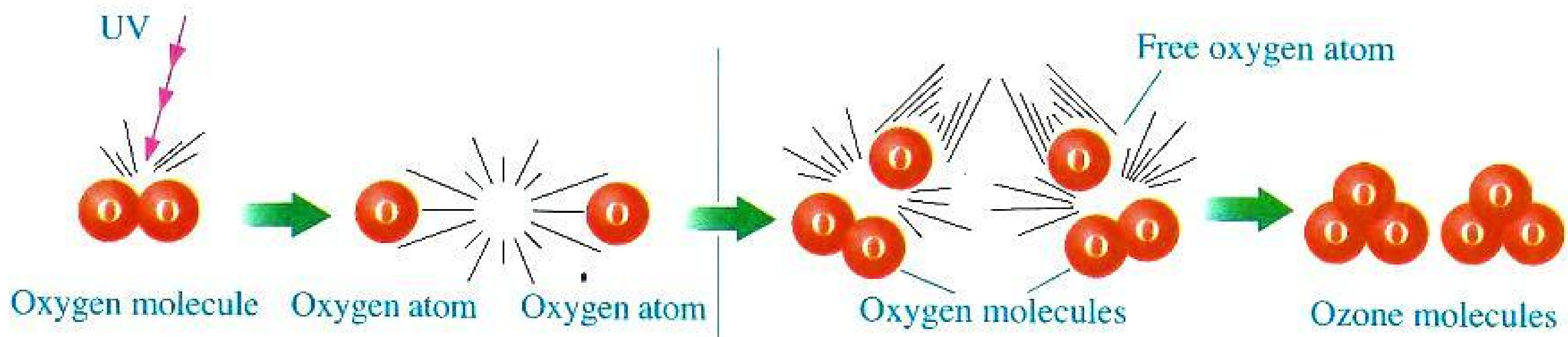
Ozone layer is composed of **ozone gas (O_3)**, which consists of **three oxygen** atoms.



Ozone molecule

Formation of ozone gas

Step 1 **Step 2**



- Oxygen gas molecule (O_2) absorbs ultraviolet (UV) radiation which causes the break down of its double covalent bond giving two free oxygen atoms (2O).

$$O_2 \xrightarrow{UV} O + O$$

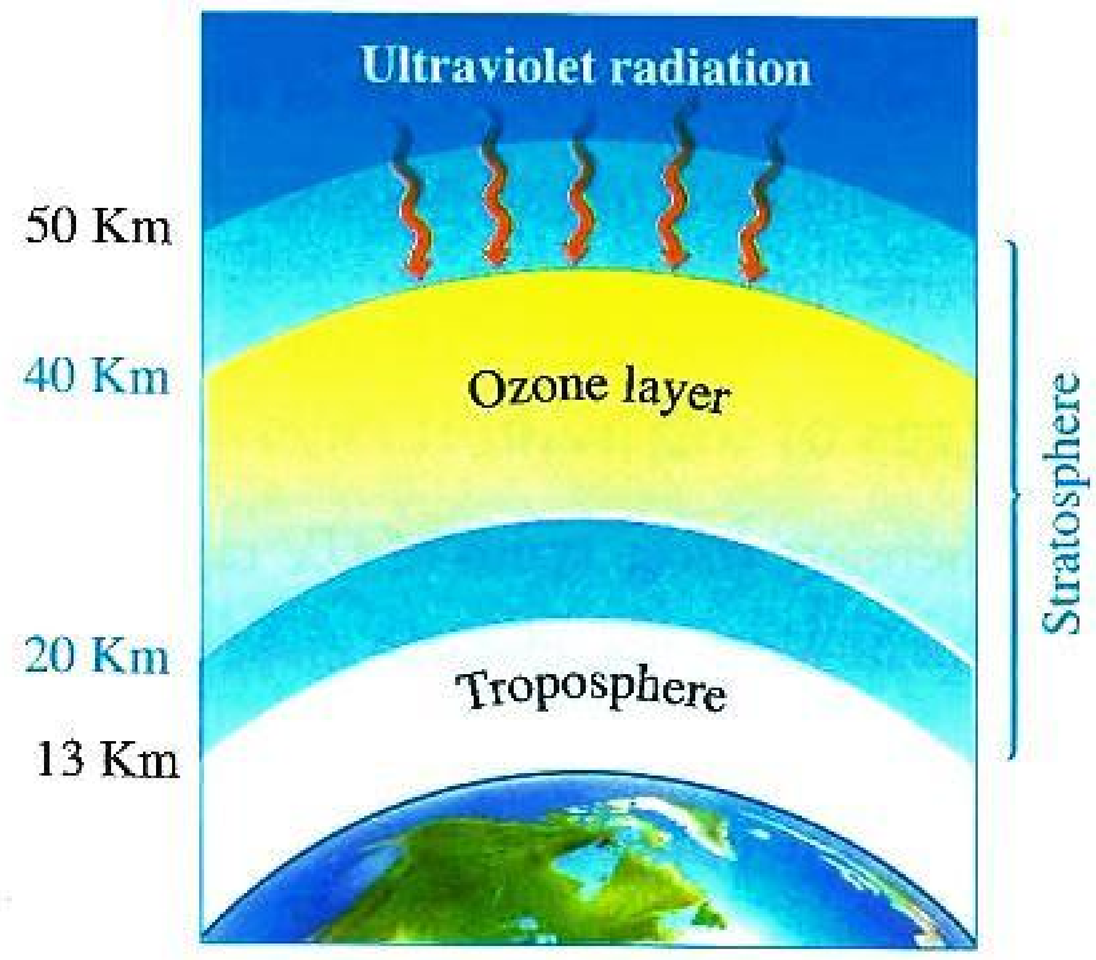
- Each free oxygen atom (O) combines with another oxygen molecule (O_2) forming ozone molecule (O_3).

$$O + O_2 \longrightarrow O_3$$

Location of ozone layer

Ozone layer extends from 20 km to 40 km height above sea level in the stratosphere layer. G.R.

Because stratosphere layer is the first layer in the atmosphere which contains suitable amount of oxygen gas, that faces ultraviolet radiations emitted from the Sun.



Location of ozone layer

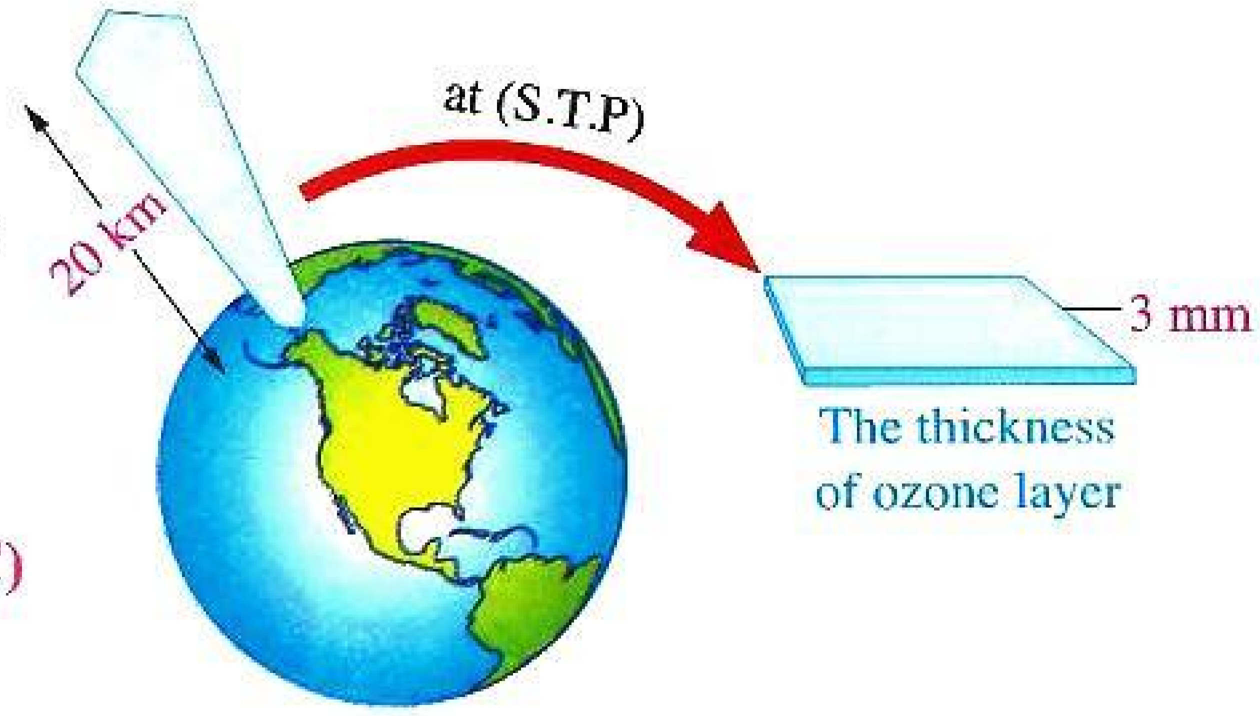
▸ Enrichment information

Ozone gas has a faint blue colour and a distinct smell. This can be observed near instruments that contain electric discharge pipes as in the cases of light photographic machines and TV sets.

Thickness of ozone layer

- From the previous lesson, you know that the atmospheric pressure and temperature in stratosphere layer are less than the atmospheric pressure and temperature at the sea level, so ozone gas spread forming a layer of **20 km thickness**.

- The English scientist **Dobson** postulated that the thickness of the ozone layer is compressed into only **3 mm (millimetre)**, if it were subjected to the ordinary temperature and normal atmospheric pressure which is known as (STP).
  [STP means standard temperature (0°C) and pressure (1013.25 mbar)].



Accordingly

Dobson assumed that :
the normal degree of ozone is **300 Dobson** (where each 1 mm thickness is equivalent to 100 Dobson).

Note

The degree of ozone is measured by **Dobson** unit.

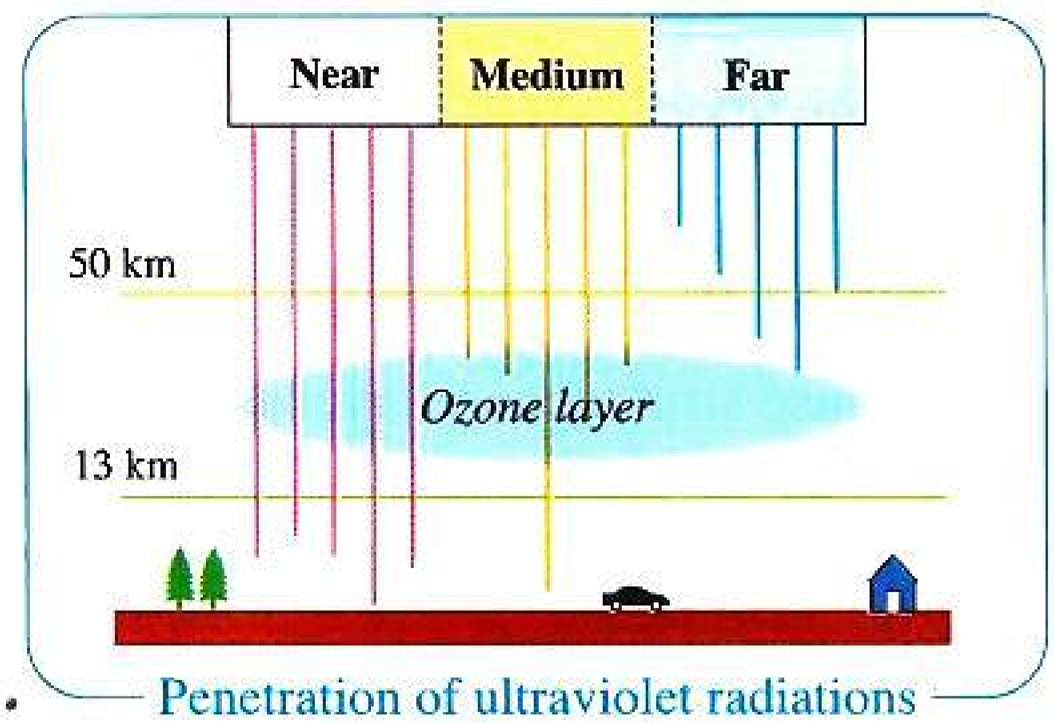
Importance of ozone layer

- To know the importance of ozone layer, we should know the types of ultraviolet (UV) rays and their ranges of penetration through ozone layer.

Types of ultraviolet rays

- There are **three types** of UV rays that differ in **wavelength** and **range of penetration** through ozone layer,
  As in the opposite figure and the following table :

(Ultraviolet rays)



Penetration of ultraviolet radiations through ozone layer

(Ultraviolet rays)

	Near	Medium	Far
Wavelength (nanometre) 1 Nanometre (nm) = 1 X 10^{-9} metre (m)	315 : 400	280 : 315	100 : 280
Range of penetration through ozone layer	**Penetrate** ozone layer by a percentage **100 %**	**Don't penetrate** ozone layer by a percentage **95 %**	**Don't penetrate** ozone layer by a percentage **100 %**
Its effect on living organisms	It is **useful** for the life of living organisms.	It is **harmful** to the life of living organisms.	

From the previous explanation, we conclude that :

The ozone layer acts as a protective shield for living organisms G.R.

Because it doesn't allow penetration of all far and most of medium ultraviolet radiations, which have harmful chemical effects and threaten the life of living organisms.

Enrichment information

Ultraviolet radiation with wavelength close to the visible light penetrates the atmosphere and reaches the Earth's surface where it helps in synthesis of vitamin (D) in the bodies of the newly born babies.

Erosion of ozone layer

- Since 1978, scientists have noticed that there was erosion of ozone layer **above the south pole of the Earth**. This phenomenon is known as an **ozone hole.**

Ozone hole:

It means thinning or losing parts of ozone layer above the south pole of the Earth.

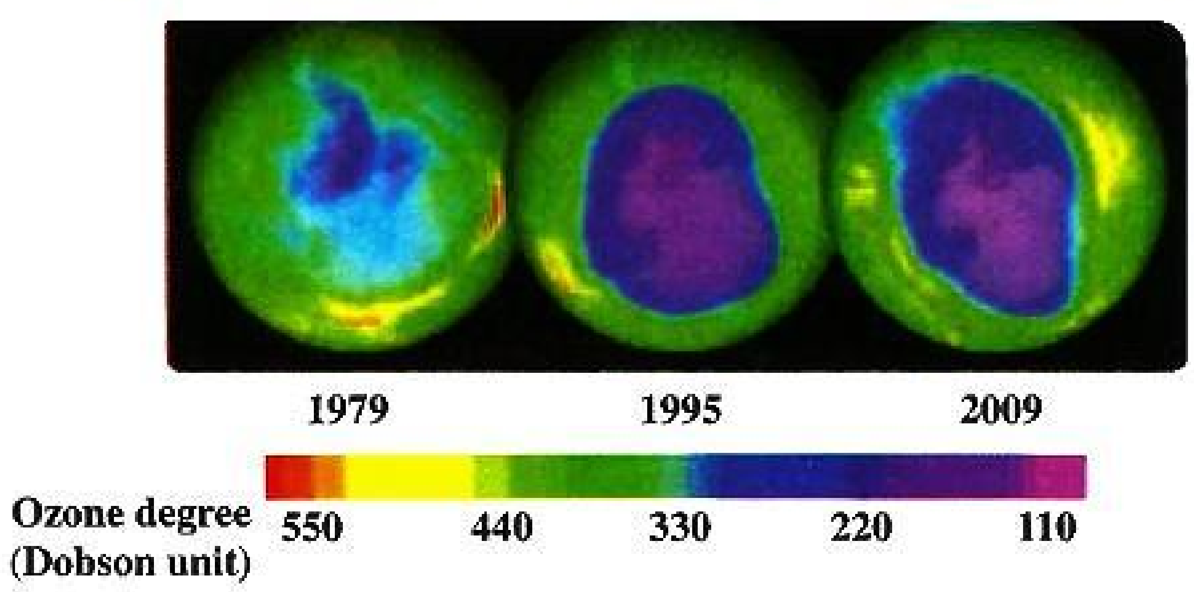
Note

Ozone hole increases in September each year.

Enrichment information

In fall 2001, erosion of ozone layer reached 20×10^6 km^2 which equals twenty times the area of Egypt. In autumn 2008, it reached 27×10^6 km^2 (i.e larger than the area of North America).

The following figure represents the ozone degree during the period [1979 : 2009]



The erosion of ozone layer increases by increasing the area of blue and violet colours.

where,

Green colour	Violet colour
refers to regions, in which the ozone layer is in its normal state (**equals** 300 Dobson).	refers to regions, in which erosion of ozone layer (**lower than** 300 Dobson).

★ **We can determine the percentage of erosion of ozone layer in a certain area as the following :**

The degree of erosion of ozone layer (in a certain area) = The normal degree of ozone (300 dobson) – The degree of ozone in this area

The percentage of erosion of ozone layer (in a certain area) = $\frac{\text{The degree of erosion of ozone layer}}{\text{The normal degree of ozone}} \times 100$

Exercise

What is the percentage of erosion of ozone layer in an area, if you know that the degree of its ozone is 150 Dobson?

TRY to answer worksheet 14 in the Notebook

Answer

The degree of erosion of ozone layer in an area = 300 – 150 = 150 Dobson.

The percentage of erosion of ozone layer in this area = $\frac{150}{300} \times 100 = 50\%$

Pollutants of ozone layer

1 **Chlorofluorocarbon compounds (CFC_s):**

They are commercially known as Freon, which is used as :

- A cooling substance in air conditioning sets.
- A propellant substance in aerosols.
- A flating substance in making foam backing.
- A solvent substance for cleaning electric circuits boards.



2 **Methyl bromide gas :**

It is used as an insecticide to preserve stored agricultural crops.



3 **Halons :**

They are used in extinguishing fires.



4 Nitrogen oxides :

They are produced from the burning of fuel of ultrasound concorde aeroplanes.

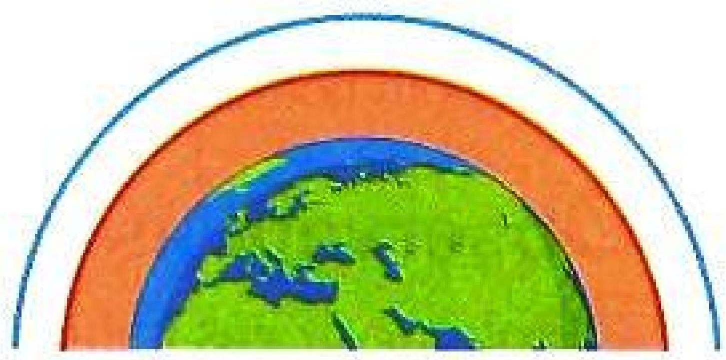


Protecting the ozone layer

- We must reduce the use of chlorofluorocarbon compounds and find safer alternatives.
- We must stop producing the ultrasound concorde aeroplanes.

Second Global Warming phenomenon

Researches of the **IPCC** (*the Intergovernmental Panel on Climate Changes*) that follows UN (*United Nations*) showed that there is an increase in the average temperature of the Earth's near-surface air, which is known as **global warming phenomenon**.

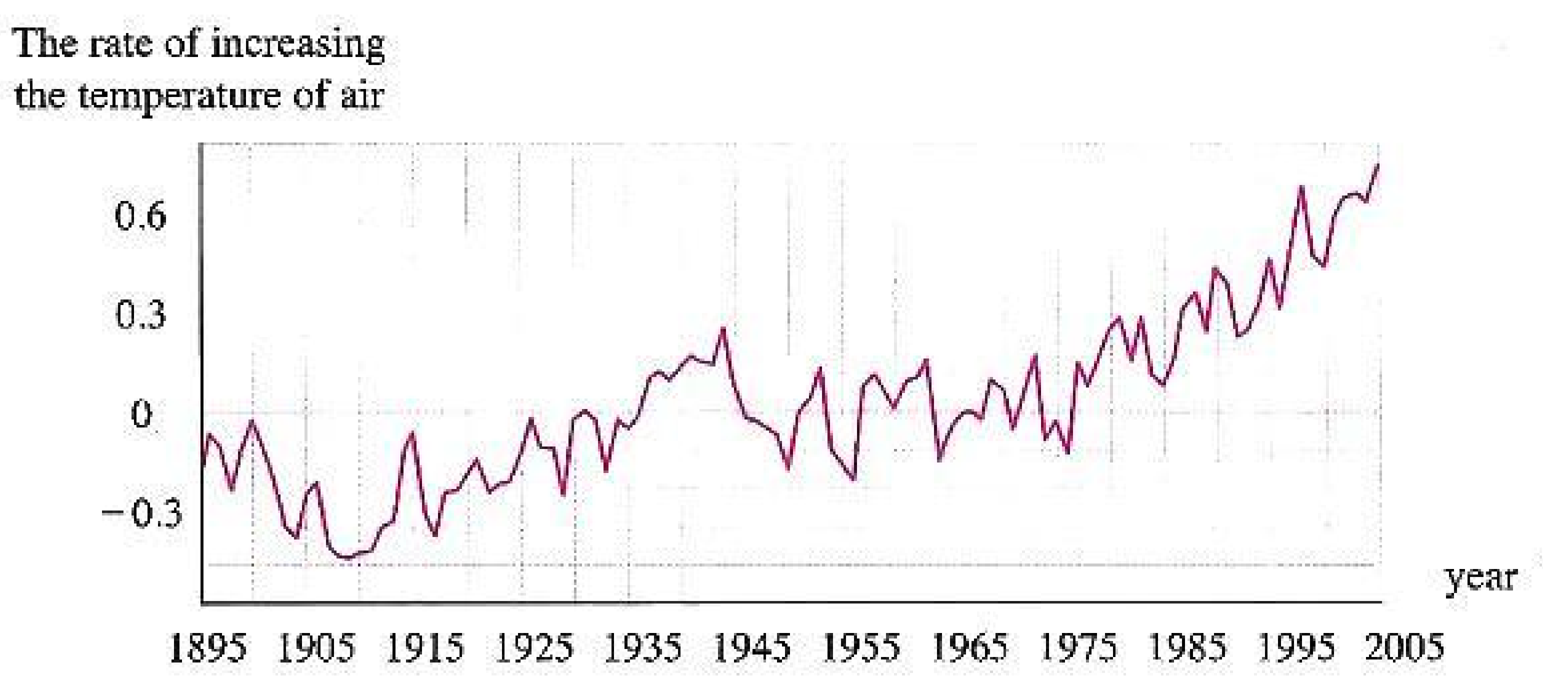


Global warming phenomenon

Global warming phenomenon:

It is the continuous increase in the average temperature of the Earth's near-surface air.

- **The following figure shows the rising of the planet Earth's temperature during the past years.**



Rising of planet Earth's temperature

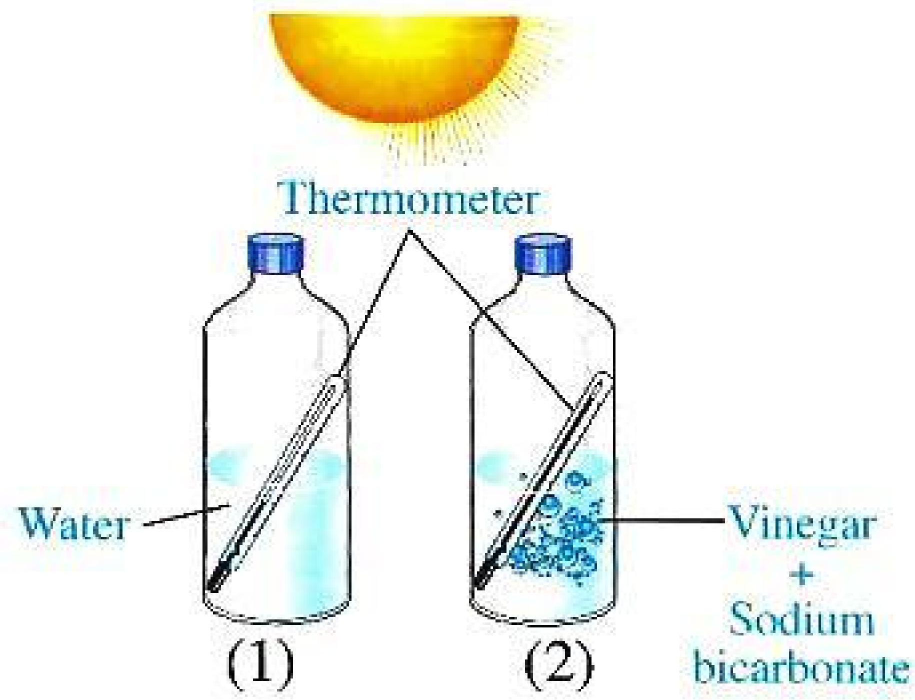
Reasons for global warming phenomenon

Researches have also shown that the global warming phenomenon is caused by the greenhouse effect.

Activity **To know the greenhouse effect :**

Tools :

- 2 empty soda bottles.
- Water.
- 2 thermometers.
- Vinegar.
- Sodium bicarbonate powder.



Steps :

1. Pour some water in bottle (1) and the same amount of vinegar in bottle (2).
2. Insert a thermometer in each bottle.
3. Close bottle (1) and put some sodium bicarbonate powder in bottle (2) and close it immediately.
4. Put both bottles in a sunny place for 10 minutes.

Observations :

- Evolving of gas bubbles in bottle (2).
- Higher reading of the thermometer in bottle (2).

Note

CO_2 gas is produced from the reaction between vinegar and sodium bicarbonate.

Conclusion:

The increase in the concentration of CO_2 gas leads to the increase in temperature.

Similarly :

The temperature of the planet Earth has been increasing since 1935 due to increasing the greenhouse gases (especially CO_2).

* The most important greenhouse gases :

1. Carbon dioxide gas (CO_2).
2. Chlorofluorocarbon compounds (CFC_S).
3. Methane gas (CH_4).
4. Nitrous oxide gas (N_2O).
5. Water vapour (H_2O).

For illustration

The percentage of CO_2 is increased in the atmosphere to 0.038 % in 2005 after it was 0.031%

⊙ The reasons of increasing the percentage of greenhouse gases in the atmosphere :

1. Fossil fuel burning.



2. Cutting trees.



3. Forests fires.



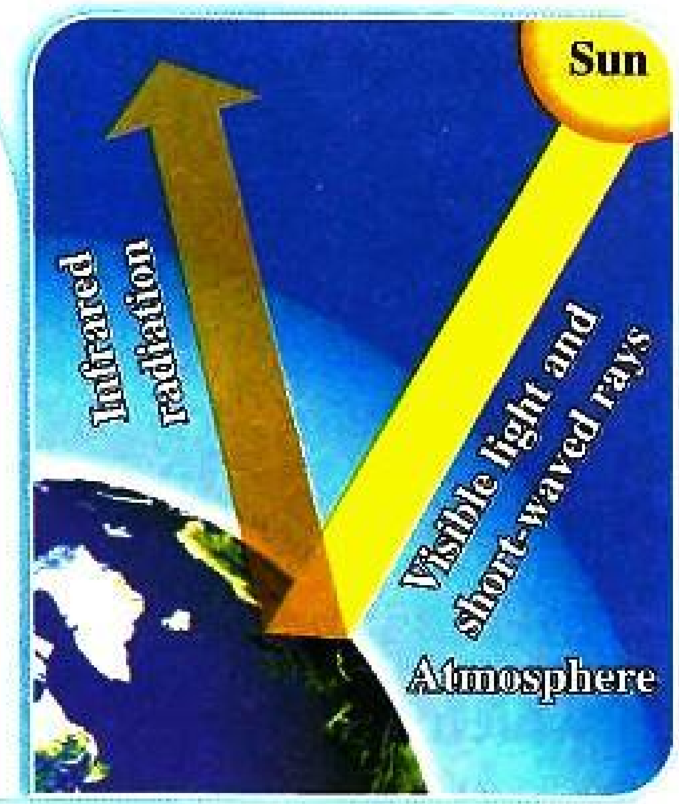
TRY to answer worksheet 15 in the Notebook

Interpretation of the greenhouse phenomenon

When the concentration of greenhouse gases increases in the atmosphere, the atmosphere plays the role of glass in the greenhouse as :

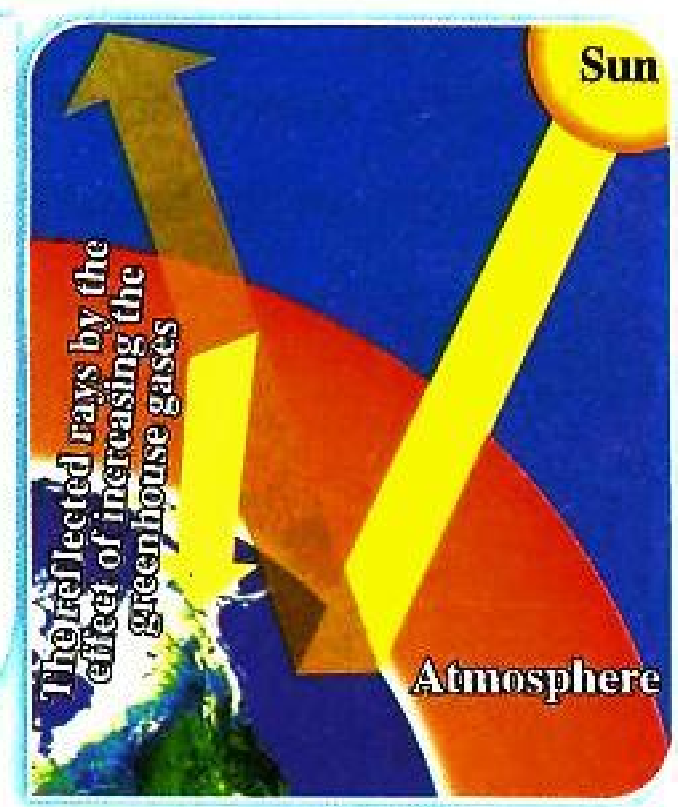
*** In case of presence of normal percentage of greenhouse gases in troposphere :**

- The atmosphere permits the visible light and short-waved rays emitted from the Sun to pass through.
- The Earth and its components absorb these rays and reemit the radiation back in the form of **infrared radiation**.



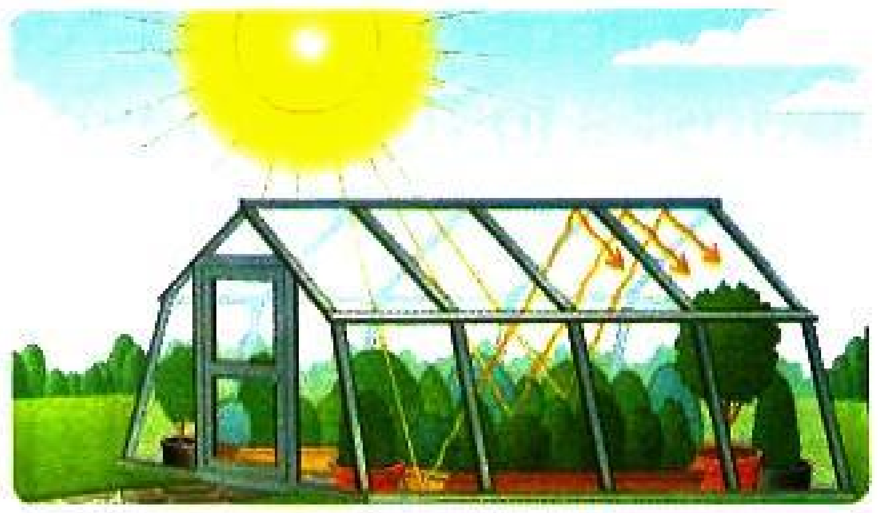
*** When the rate of greenhouse gases increases in troposphere,** some of infrared radiation cannot penetrate the atmosphere **because it has a long wavelength.**

So it is kept trapped in the troposphere causing the rise in the planet Earth's temperature which is known as **Greenhouse effect**.



Greenhouse effect:

It is the trapping of infrared radiation in the troposphere layer due to the increase in the percentage of greenhouse gases which cause the increase in the planet Earth's temperature.



Greenhouse effect

Note

The ultraviolet radiation has a **chemical effect**, while infrared radiation has a **thermal effect**.

Enrichment information

Greenhouse gases are considered a blessing which can be changed into a catastrophe, where without these gases, the temperature of the Earth would have decreased to – 18°C and the increase in its concentration in the atmosphere will lead to environmental disasters.

The negative effects of global warming phenomenon

Among the most dangerous consequences of raising the temperature of the Earth planet due to global warming phenomenon are :

1. **Melting the snow of the two poles.**
2. **Severe climatic changes.**

1 Melting the snow (ice) of both south and north poles :

Melting the polar ice would increase the level of seas and oceans, which leads to :

1. Disappearance of some coastal areas.
2. Extinction of some polar animals like the polar bear and seals due to the damage of their normal habitate.



Melting masses of snow



Polar bear



Seals

G.R. ***Global warming phenomenon seriously affects the life on poles.***
Because it causes melting of the snow of both south and north poles which would increase the level of seas and oceans.

2 Severe climatic changes :

Among these features is the repeated occurrence of :

1. **Tropical hurricanes** such as hurricane Katrina in 2005.



2. **Destructive floods.**



3. **Drought waves.**



4. **Forests fires.**



TRY to answer worksheet 16
- General Exercise of the School Book on Unit 2
- Model exams on Unit 2

in the Notebook

Remember

Lesson Two

- Ozone layer extends from 20 km to 40 km above sea level in the stratosphere layer.
- Ozone molecule is composed of three oxygen atoms (O_3).
- At STP, thickness of the ozone layer is compressed into 3 mm according to scientist Dobson.
- Ozone layer acts as a protective shield for living organisms against the harmful chemical effects of ultraviolet radiations.
- **Ozone hole :** Thinning or losing parts of ozone layer above the south pole.
- From pollutants of ozone layer : CFC_s, methyl bromide gas, halons and nitrogen oxides.
- **Comparison between different types of ultraviolet rays :**

	(Ultraviolet rays) Near	Medium	Far
Wavelength (nanometre) 1 Nanometre (nm) = 1×10^{-9} metre (m)	315 : 400	280 : 315	100 : 280
Range of penetration through ozone layer	**Penetrate** ozone layer by a percentage **100%**	**Don't penetrate** ozone layer by a percentage **95%**	**Don't penetrate** ozone layer by a percentage **100%**
Its effect on living organisms	It is **useful** for the life of living organisms.	It is **harmful** to the life of living organisms.	

- **Global warming phenomenon :** It is the continuous increase in the average temperature of the Earth's near-surface air.
- The most important greenhouse gases :
  CO_2 gas - CFC_s - Methane gas - Nitrous oxide gas - Water vapour.
- **Greenhouse effect :**
  It is the trapping of infrared radiation in the troposphere layer due to increase in the percentage of greenhouse gases, which cause the increase in planet Earth's temperature.
- Ultraviolet radiation has a chemical effect, while infrared radiation has a thermal effect.

✪ Among the most dangerous effects of global warming phenomenon are :

- Melting the snow of the two poles.
- Severe climatic changes.

Comparison between greenhouse effect and ozone hole :

Points of comparison	Greenhouse effect	Ozone hole
• **Reasons :**	**Increasing the percentage of greenhouse gases in the atmosphere such as :** • Carbon dioxide gas (CO_2). • CFC_s compounds. • Methane gas (CH_4). • Nitrous oxide gas (N_2O). • Water vapour (H_2O).	**The atmosphere contains compounds that pollute the ozone layer such as :** • CFC_s compounds. • Methyl bromide gas. • Halons. • Nitrogen oxides.
• **Harms :**	Increasing the Earth's temperature causing global warming.	Penetration of harmful ultraviolet rays to Earth's surface which threaten the life of living organisms.

Questions ? on lesson Two

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. Ozone layer is located in .... layer.
   a. troposphere b. stratosphere
   c. mesosphere d. thermosphere

2. Ozone gas molecule consists of ....
   a. four oxygen atoms. b. two oxygen atoms.
   c. three oxygen atoms. d. one oxygen atom.

3. Oxygen molecule splits into two free atoms in the stratosphere layer under the effect of ....
   a. heat. b. infrared radiations. c. ultraviolet radiations. d. cooling down.

4. Scientist .... proposed that the thickness of ozone layer is about 3 mm under the standard temperature and pressure.
   a. Newton b. Edeson c. Dobson d. Watson

5. 📖 Ozone degree is measured in a unit called ....
   a. km. b. Dobson. c. mm^3. d. nm.

6. Degree of ozone at STP is .... Dobson.
   a. 100 b. 200 c. 300 d. 400

7. One Dobson unit is defined as ....
   a. 3 mm. b. 0.1 mm. c. 0.01 mm. d. 0.001 mm.

8. Ozone layer absorbs ....
   a. infrared rays. b. ultraviolet rays. c. X-ray. d. light rays.

9. The ozone layer does not allow the passage of all .... ultraviolet rays.
   a. far b. medium c. near d. normal

10. Ozone layer allows 100% of the .... UV rays to penetrate the Earth's atmosphere.
    a. far b. medium c. near d. normal

11. Nanometre equals .... metre.
    a. 1×10^{-3} b. 1×10^{-6} c. 1×10^{-9} d. 1×10^{-12}

12. Ozone hole appears over the ....
    a. equator. b. north pole. c. south pole. d. middle east.

13. Ozone hole increases in .... each year.
    a. December b. September c. January d. October

14. .... compounds are known commercially as freon.
    a. Halons b. Nitrogen oxides c. Hydrocarbons d. Chlorofluorocarbon

15. All the following are from the uses of chlorofluorocarbon compounds except ....
    a. solvent substance. b. flating substance.
    c. propellant substance. d. heating substance.

16. .... is/are used as a coolant in cooling devices.
    a. Methyl bromide gas
    b. Halons
    c. Nitrogen oxide
    d. Freon

17. .... is/are used in extinguishing fires.
    a. Methyl bromide gas
    b. Halons
    c. Nitrogen oxides
    d. UV radiations

18. All of the following cause erosion of ozone layer except ....
    a. freon.
    b. aerosols.
    c. nitrogen oxides.
    d. iron oxides.

19. .... is/are used as an insecticide to preserve stored agricultural crops.
    a. Methyl bromide gas
    b. Halons
    c. Nitrogen oxide
    d. Freon

20. .... result(s) from the burning of fuel of ultrasound concorde aeroplanes.
    a. Methyl bromide gas
    b. Halons
    c. Nitrogen oxide
    d. Freon

21. Greenhouse effect explains ....
    a. erosion of ozone layer.
    b. global warming phenomenon.
    c. a new way of agriculture.
    d. water evaporation.

22. All of the following gases are greenhouse gases except ....
    a. CO_2
    b. O_2
    c. N_2O
    d. CH_4

23. All the following reasons are causing of global warming except ....
    a. increasing in carbon dioxide in the atmosphere.
    b. decreasing in carbon dioxide in the atmosphere.
    c. cutting trees.
    d. forest fires.

24. All the following are negative effects of global warming except ....
    a. melting the ice at the north pole.
    b. severe climatic changes.
    c. the lack of ozone gas in the atmospheric envelope.
    d. melting the ice at the south pole.

25. .... is/are among the reasons for increasing CO_2 gas percentage.
    a. Watering the land
    b. Cutting trees only
    c. Forests fires only
    d. Cutting trees and forests fires.

26. .... radiation is characterized by thermal effect.
    a. Infrared
    b. Ultraviolet
    c. Visible light
    d. X-ray

27. .... is from the animals that will extinct due to the melting of ice in the north and south pole (as a result of global warming).
    a. Polar bear
    b. Blue whale
    c. Mammoth
    d. Squirrel

2. Choose from column (B) what suits it in column (A) :

(1)

(A)	(B)
1. The thickness of ozone layer in the stratosphere layer is	a. 95%
2. The thickness of ozone layer at STP is	b. 20 km
3. The percentage of near UV radiations that are absorbed by the ozone layer is	c. 40 km
	d. 3 mm
4. The percentage of medium UV radiations that don't penetrate ozone layer is	e. 0%

(2)

(A)	(B)
1. Freon is used in	a. extinguishing fires.
2. Methyl bromide is used in	b. making foam boxes.
3. Halons are used in	c. iron industry.
	d. insecticides.

(3)

(A)	(B)
1. Methane gas	a. H_2O
2. Water vapour	b. CO_2
3. Nitrous oxide gas	c. CH_4
4. Carbon dioxide gas	d. CFC_s
5. Chlorofluorocarbon compounds	e. NO_2
	f. N_2O

3. Put (✓) in front of correct statements and (×) in front of incorrect ones, then correct it :

1. Ozone layer is found in the stratosphere layer. ( )
2. Ozone molecule is formed by the bonding of two oxygen atoms. ( )
3. The ozone layer extends from 20 to 30 km above sea level. ( )
4. Ultraviolet radiation splits the ozone molecule into two atoms. ( )
5. Millibar is the unit of measuring the ozone degree. ( )
6. Nanometre (nm) = 1×10^9 m. ( )
7. The ozone layer allows the passage of all near and medium ultraviolet rays. ( )
8. The ozone layer acts as a protective shield for living organisms. ( )
9. Nitrogen oxides are among pollutants that affect the ozone layer. ( )
10. Freon is used as a coolant in cooling devices. ( )
11. Methyl bromide gas is used as an insecticide. ( )
12. Nitrogen oxides result from fuel burning of ultrasound aeroplanes. ( )
13. Halons are produced from fuel burning of supersonic aeroplanes. ( )
14. The ozone layer erosion differs in size every year. ( )

15. The increase in carbon dioxide gas percentage in the atmospheric envelope leads to the increase in the Earth's temperature. ( )
16. Decreasing of plants on the Earth leads to the increase in its temperature. ( )
17. Infrared radiation can't penetrate the atmosphere because of its short wavelength. ( )
18. Methane gas and nitrous oxide are considered as greenhouse gases. ( )
19. CFC_S compounds are from the causes of ozone hole and global warming. ( )
20. Extinction of some polar animals is one of the negative effects of global warming phenomenon. ( )
21. From the negative effects of climatic changes are the happening of tropical hurricanes, destructive floods, drought waves and forests fires. ( )

4. Write the scientific term of each of the following :

1. A molecule is formed by combining an atom of an element with molecule of the same element.
2. A gas which is important for building ozone gas.
3. A kind of radiations that can break down oxygen molecule forming free oxygen atoms.
4. The atmospheric layer, in which ozone layer is formed.
5. A unit used for measuring ozone degree.
6. An atmospheric layer that acts as a shield which protects living organisms from the danger of ultraviolet radiation.
7. A type of ultraviolet radiations that is absorbed completely (100%) by the ozone layer.
8. A type of ultraviolet rays that is absorbed by a percentage 95% by ozone layer.
9. A type of ultraviolet rays that penetrates the ozone layer by a percentage 100%
10. Kinds of rays that cause harmful effects to living organisms.
11. Thinning or losing parts of ozone layer above the south pole.
12. A chemical compound used as a cooling material in air conditioning sets and refrigerators.
13. A gas used as an insecticide and causes the increase in ozone hole.
14. Compounds used in extinguishing fires and considered from the most dangerous pollutants of ozone layer.
15. Oxides that cause ozone hole and result from burning of the fuel of concorde planes.
16. The continuous increase in the average temperature of the air near the surface of the Earth.
17. Gases when their percentages increase, the temperature of the planet Earth increases.
18. One of the atmosphere components that its ratio increased in recent years to reach about 0.038%
19. A kind of radiations that causes the rise in temperature in troposphere layer.
20. Trapping of infrared radiation in troposphere layer due to the increase in the percentage of greenhouse gases which leads to the increase in the planet Earth's temperature.

5. Complete the following statements :

1. .... and .... are the two most dangerous phenomena that face the Earth's atmosphere.
2. Ozone layer extends from .... to .... km above sea level.
3. The ozone layer is located in the stratosphere which contains a suitable amount of .... gas, and its thickness is about .... km.
4. .... is formed by the combination of three active oxygen atoms.
5. Ozone gas is formed in two steps which are :

   (a) $O_2 \xrightarrow{UV} O +$ .... (b) $O +$ .... $\longrightarrow O_3$
6. The thickness of ozone layer is about .... mm or equals .... Dobson at the standard temperature and pressure.
7. The ultraviolet rays are three kinds which are .... , ... and .... ultraviolet rays.
8. The nanometre equals .... metre.
9. Ozone layer allows penetration of all .... ultraviolet rays and absorbs most of .... ultraviolet rays.
10. The erosion of ozone layer above the .... pole increases in the month of .... every year.
11. CFC_S compounds are commercially known as .... and they are used in ....
12. Among the pollutants of ozone layer are .... compounds that are used in air conditioning sets and .... compounds that are used in fire extinguishers.
13. .... is used as insecticide to preserve the stored agriculture crops.
14. .... oxides are produced from burning of the fuel of supersonic aeroplanes (concorde).
15. Among the reasons for increasing CO_2 gas percentage in the atmosphere is burning of .... and ....
16. The most known greenhouse gases are .... , CFC_S , ... and nitrous oxide.
17. The glass permits the passage of .... and .... rays coming from the Sun to be absorbed by Earth in the greenhouse.
18. .... radiation is trapped in troposphere layer, because this kind of radiation has .... wavelength.
19. Ultraviolet radiation has a .... effect, and infrared radiation has a .... effect.
20. .... and .... are among negative effects of global warming phenomenon.
21. .... and .... are considered from the negative effects of the climatic changes resulting from global warming.

6. Give reasons for :

1. Formation of ozone layer in the stratosphere layer.
2. The ozone layer acts as a protective shield for living organisms.
3. Increasing the size of ozone hole in September every year.
4. Chlorofluorocarbon compounds are dangerous to the environment.
5. Factories should stop their production of foam boxes.
6. Scientists decrease using freon as a cooling material.
7. Stop producing concorde aeroplanes.
8. Increasing the average temperature of the Earth's near-surface air during the last years.
9. Increasing in CO_2 gas percentage in the atmosphere.
10. Infrared radiation cannot penetrate the Earth's atmosphere.
11. Naming global warming phenomenon by greenhouse effect.
12. The global warming phenomenon has negative effects on Earth.
13. Most countries are attempting to reduce the use of fossil fuel.

7. What is meant by ...?

1. Dobson.
2. STP
3. Ozone hole.
4. CFC_S
5. IPCC
6. Global warming phenomenon.
7. Greenhouse gases.
8. Greenhouse effect.

8. What do the following numbers indicate ...?

1. Three oxygen atoms.
2. 280 : 315 nm.
3. 1×10^{-9} m.
4. A layer of 20 km thickness in stratosphere layer.
5. 300 Dobson.

9. What is the importance of ...?

1. Ultraviolet radiations.
2. Ozone layer.
3. Chlorofluorocarbon compounds.
4. Methyl bromide gas.
5. Halons.

10. Give an example of each of the following :

1. Dangerous pollutant causes depletion of ozone layer.
2. Greenhouse gases.
3. One of the severe climatic changes.

11. Explain the role of :

1. Ultraviolet radiation in the formation of ozone gas.
2. CO_2 in global warming phenomenon.
3. Infrared radiation on global warming.

12. Choose the odd word out and link the rest in meaningful statements :

1. Nitrogen oxides - Water vapour - Freon - Halons.
2. Cooling instruments - Cleaning electronic slides - Extinguishing fires - Aerosols propellers.
3. Methyl bromide - Carbon dioxide - Water vapour - Methane gas.
4. Destructive floods - Forests fires - Drought waves - Greenhouse effect.

13. What would happen when ...?

1. Ultraviolet radiation hits oxygen molecules.
2. Oxygen atom combines with oxygen molecule.
3. Existence of ozone in conditions of standard temperature and pressure (STP).
4. Overuse of methyl bromide gas as an insecticide.
5. Increasing in the percentage of nitrogen oxides in the atmospheric envelope.
6. Overuse of freon.
7. Erosion of ozone layer over an area.
8. Increasing in the percentage of greenhouse gases in the atmosphere.
9. Infrared radiations don't reemit back from troposphere layer.
10. Melting the snow of south and north poles.
11. Earth's temperature increases [concerning : the climatic changes].
12. The continuous increase in consumption of fossil fuel.

14. Compare between :

1. Oxygen molecule and ozone molecule.
   [concerning : structure - the effect of ultraviolet radiations on each of them].
2. Far ultraviolet radiations and near ultraviolet radiations.
   [concerning : the percentage which penetrates ozone layer - the wavelength].
3. Greenhouse effect and ozone hole.
   [concerning : causes - harms].

15. Variant questions :

(1) "Ozone layer is found in the stratosphere layer. It is important to protect the life of organisms".

1. What is the average thickness of ozone layer in the atmosphere?
2. What is the only element that forms ozone gas?

3. **Complete :**

a. Ozone layer protects the Earth from the harmful effects of ……… radiation.

b. The thickness of ozone layer at STP is ………

4. **Put (✓) or (✗) :**

Ozone layer prevents penetration of all types of UV radiation. ( )

(2) Illustrate with formulae only, the role of ultraviolet radiation in the formation of ozone gas.

(3) "The erosion of ozone layer is a phenomenon occurred by many pollutants". Answer the following questions :

1. What are the most dangerous pollutants of ozone layer?
2. What is the commercial name of CFC_S compounds?
3. What are the oxides produced from the burning of fuel of concorde aeroplanes?
4. Mention the ways by which ozone layer can be protected.

(4) "Researches of the Intergovernmental Panel on Climate Changes showed that there is an increase in the average temperature of Earth's near-surface air"

1. What is the name of this phenomenon?
2. What is the factors that help in making it worse?
3. How does this phenomenon threaten the life of polar animals?

(5) Write short notes about :

1. The negative results of global warming phenomenon.
2. Greenhouse effect.

(6) Calculate the percentage of erosion in ozone layer in a certain area, knowing that ozone degree at this area is 255 dobson.

(7) Earth's weather is exposed to many climatic changes :

1. Mention examples about these climatic changes.
2. What is the reason for causing of these climatic changes ?

16. Study the following figures, then answer the questions :

(1) Which of the opposite figures represents:

1. an oxygen atom.

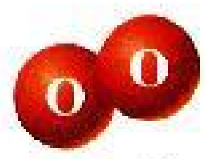


Fig. (a)

2. an ozone molecule.

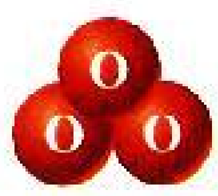


Fig. (b)

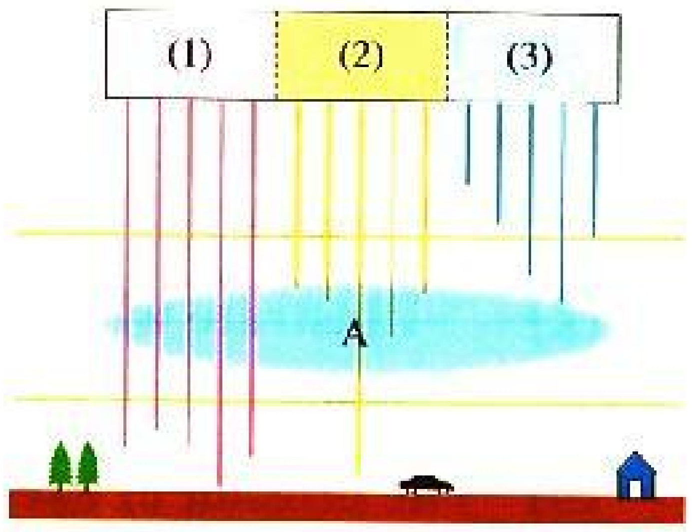
3. an oxygen molecule.



Fig. (c)

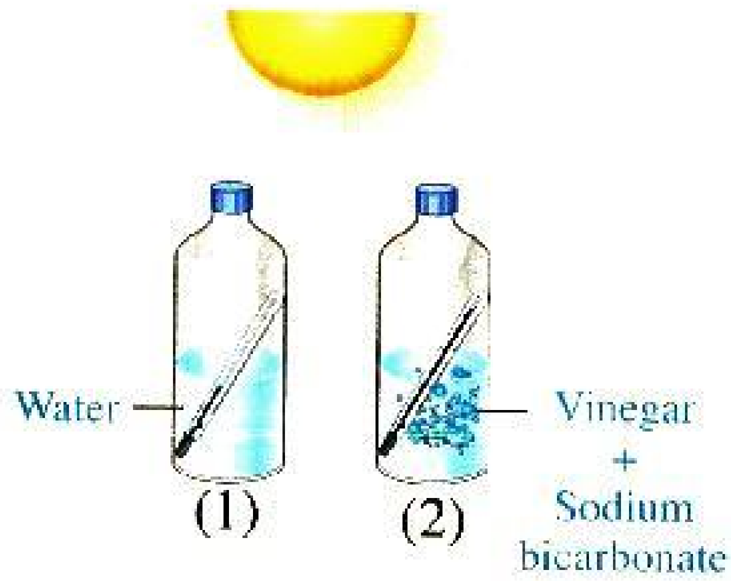
(2) Study the opposite figure, then answer :

1. What do the rays (1) , (2) and (3) represent ?
2. Which of these rays (1) , (2) or (3) has the longest wavelength ?
3. What does the area (A) indicate ? What is its thickness ? And where does it locate ?
4. Mention some compounds affect on the area (A).



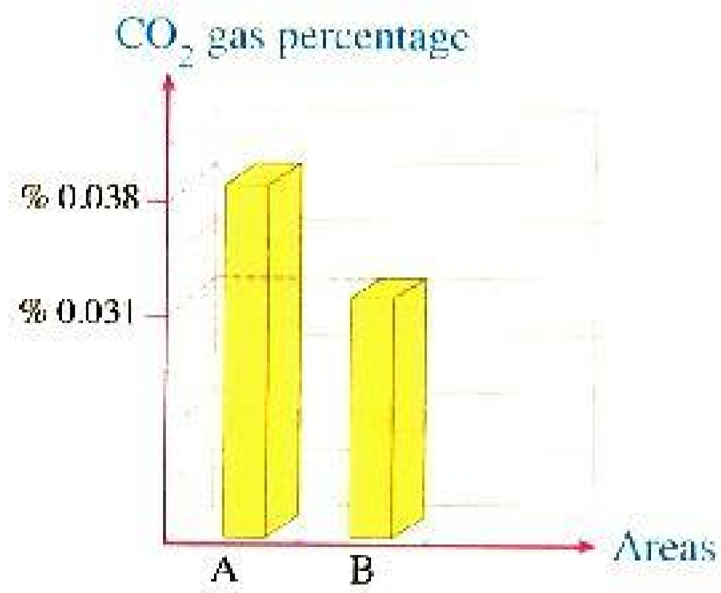
(3) Study the opposite figure, then answer :

1. What is the evolved gas from bottle (2) ?
2. In which bottle the temperature increases ? Why ?



(4) The opposite figure represents the percentage of carbon dioxide gas in two different areas, then answer :

1. In which area do you prefer to live ? Why ?
2. What is the phenomenon resulted from increasing the concentration of carbon dioxide gas in nature ?



(5) Study the opposite figure , then answer :

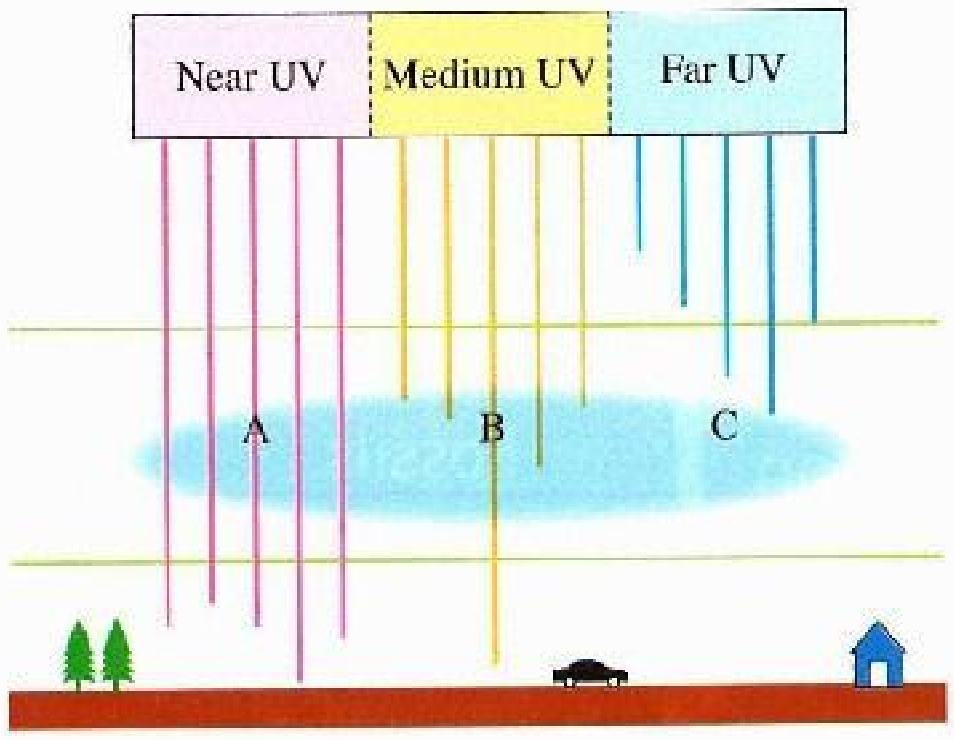
1. What does this figure represent?
2. What is the relation between greenhouse effect and global warming phenomenon ?
3. What is the type of radiation that is reflected back from the land ?



Thinking Skills Questions

1. Explain how planting green plants on the roof of the building affect the global warming phenomenon.

2. In the opposite figure :



a. What is the percentage of absorbed ultraviolet in the area symbolized by (C) ?

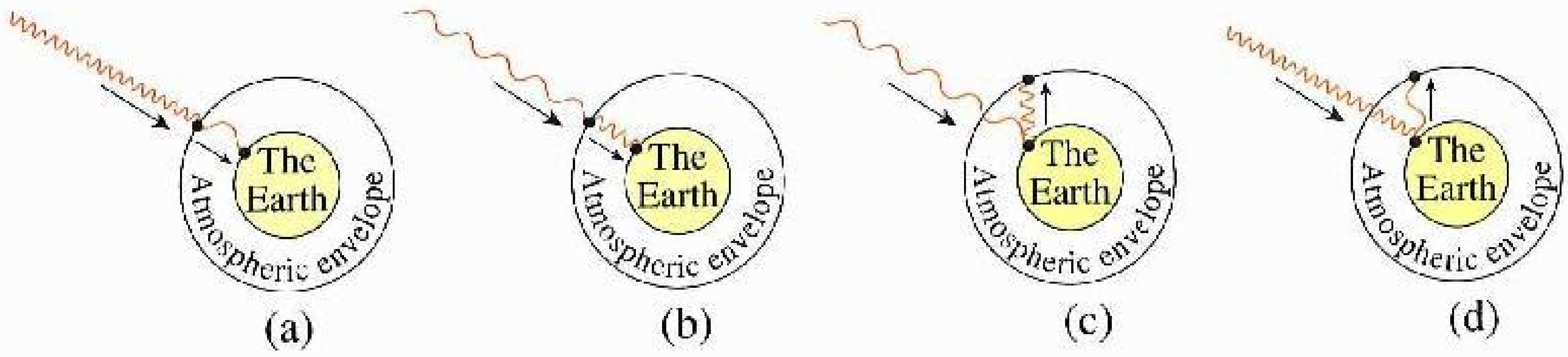
b. What is the cause of the ability of penetration the near UV rays to the ozone layer ?

3. Complete :

If the percentage of erosion of ozone layer in a certain area equals 75%, this means that the degree of ozone in this area equals .... Dobson.

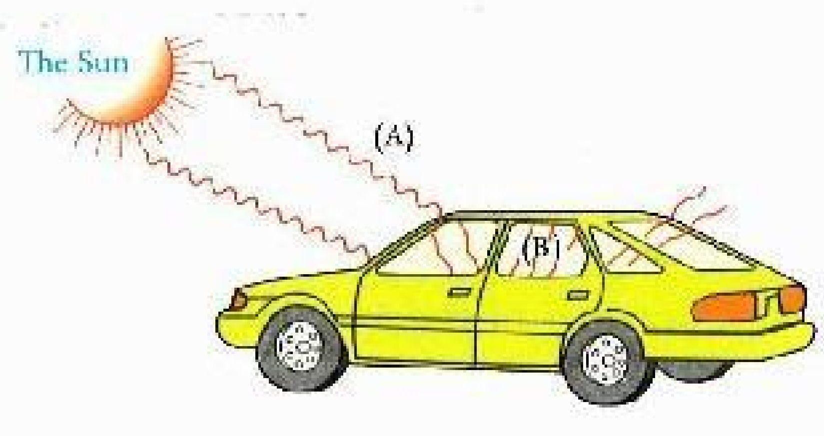
4. From the opposite key : | Visible light | Infrared radiation | Absorbed energy • |

Which one from the following figures represents the global warming phenomenon ? ....



5. The opposite figure shows a person in a car with closed windows :

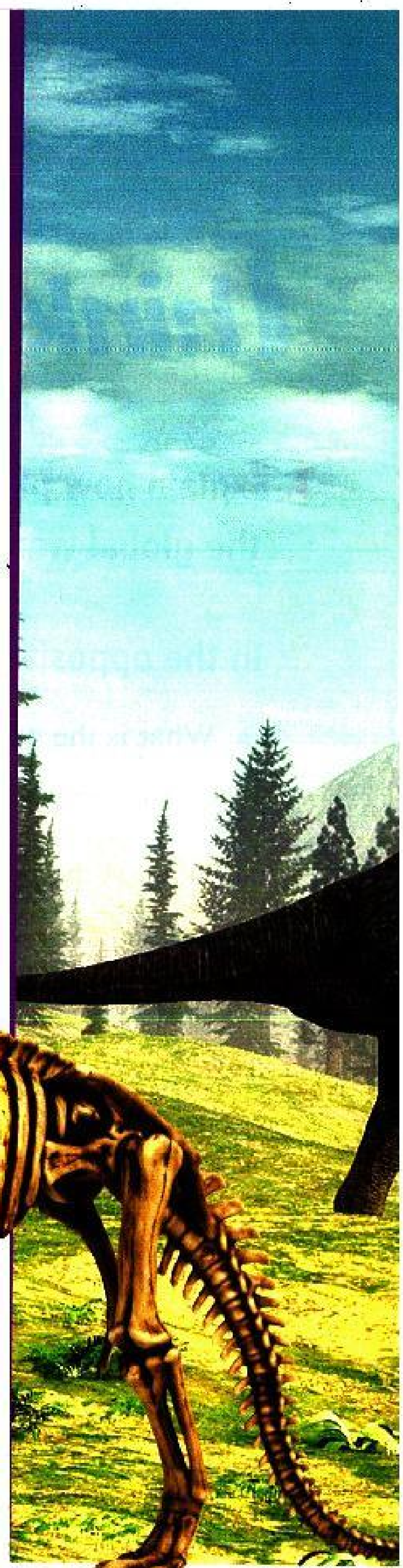
1. Replace the letters (A & B) with suitable labels.
2. What is the process expressed by this figure?

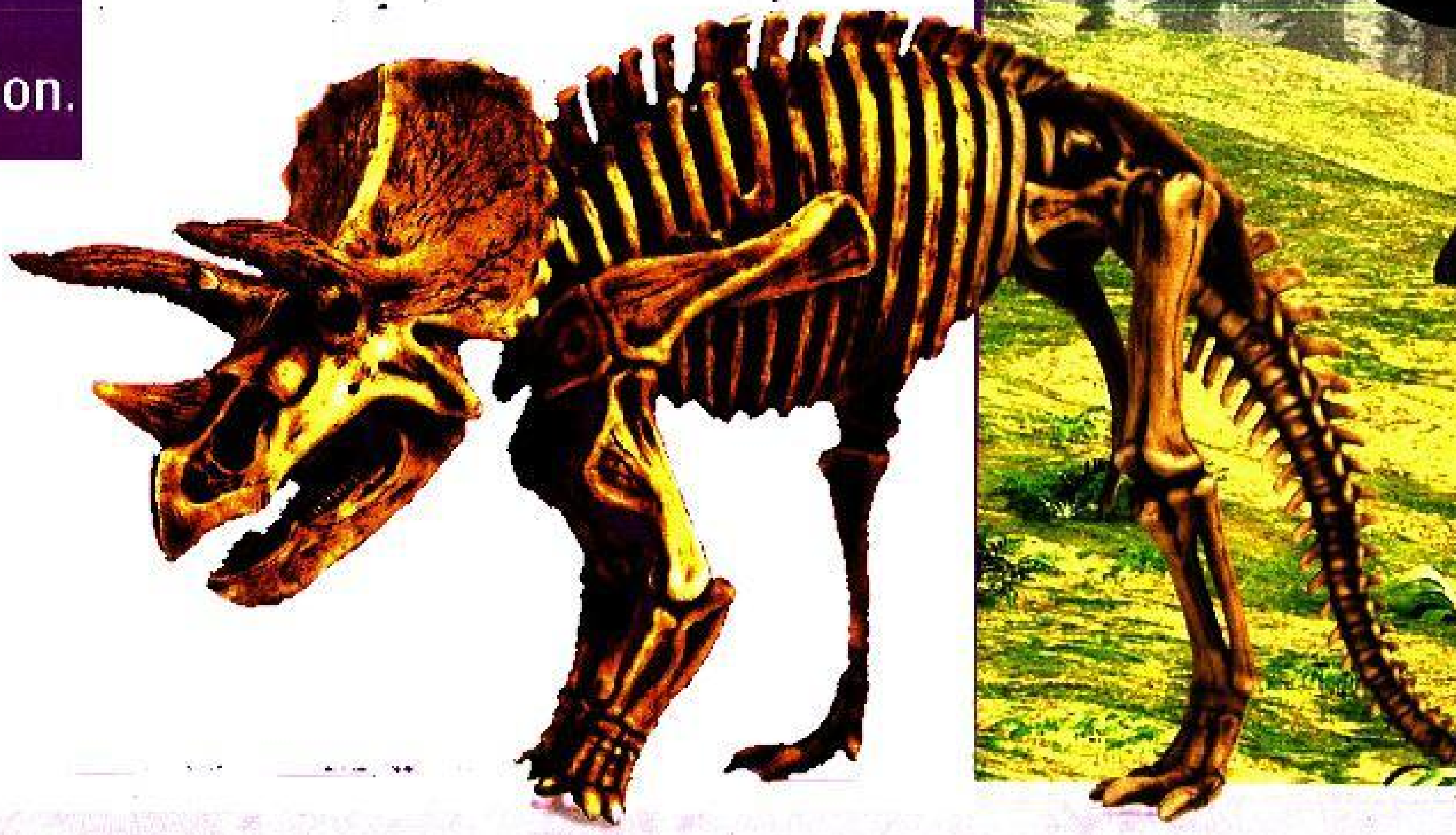


UNIT

3 Fossils and Protecting Species from Extinction

Lesson 1	Fossils.
Lesson 2	Extinction.

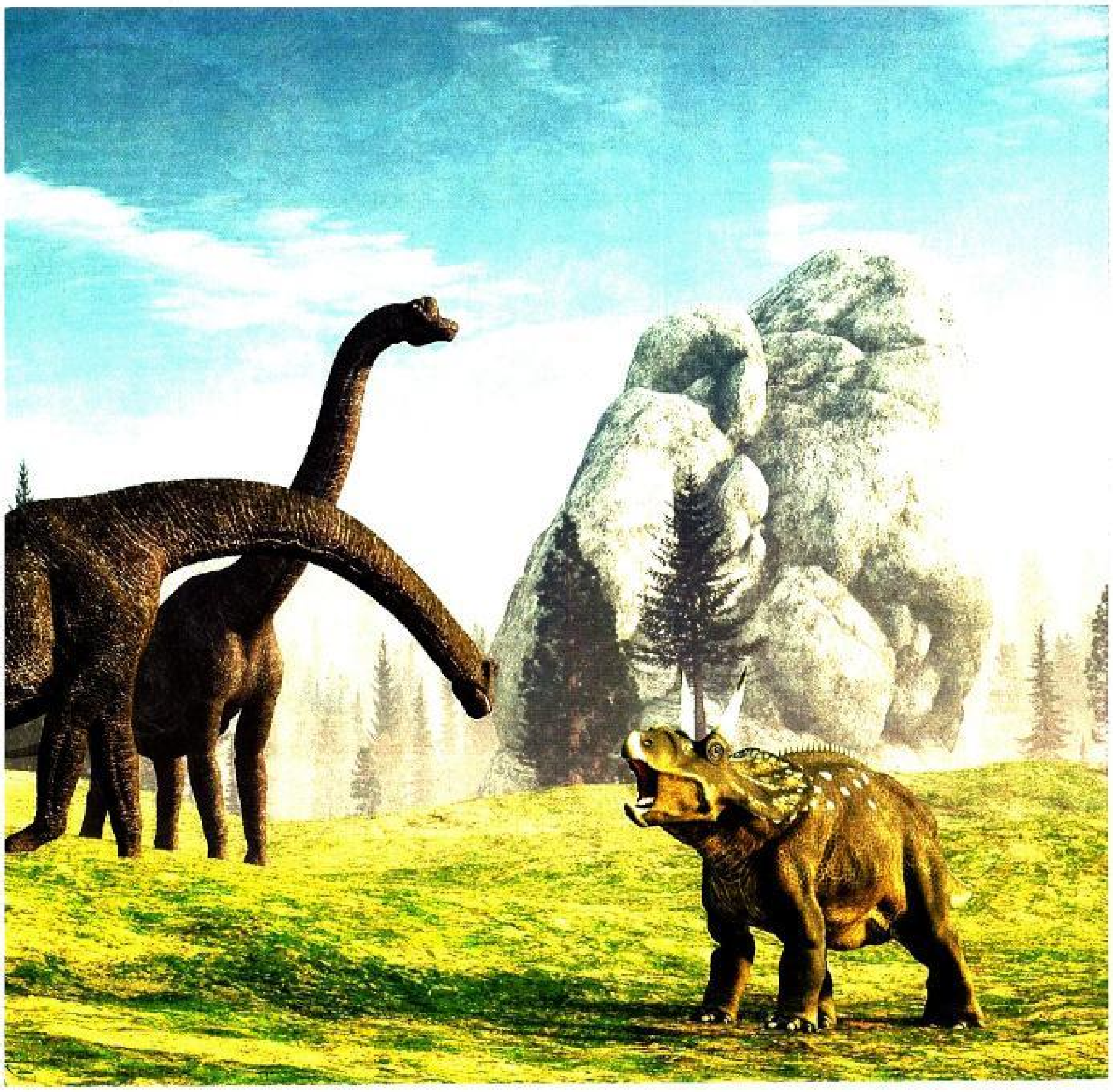




Unit Objectives :

By the end of this unit, students will be able to :

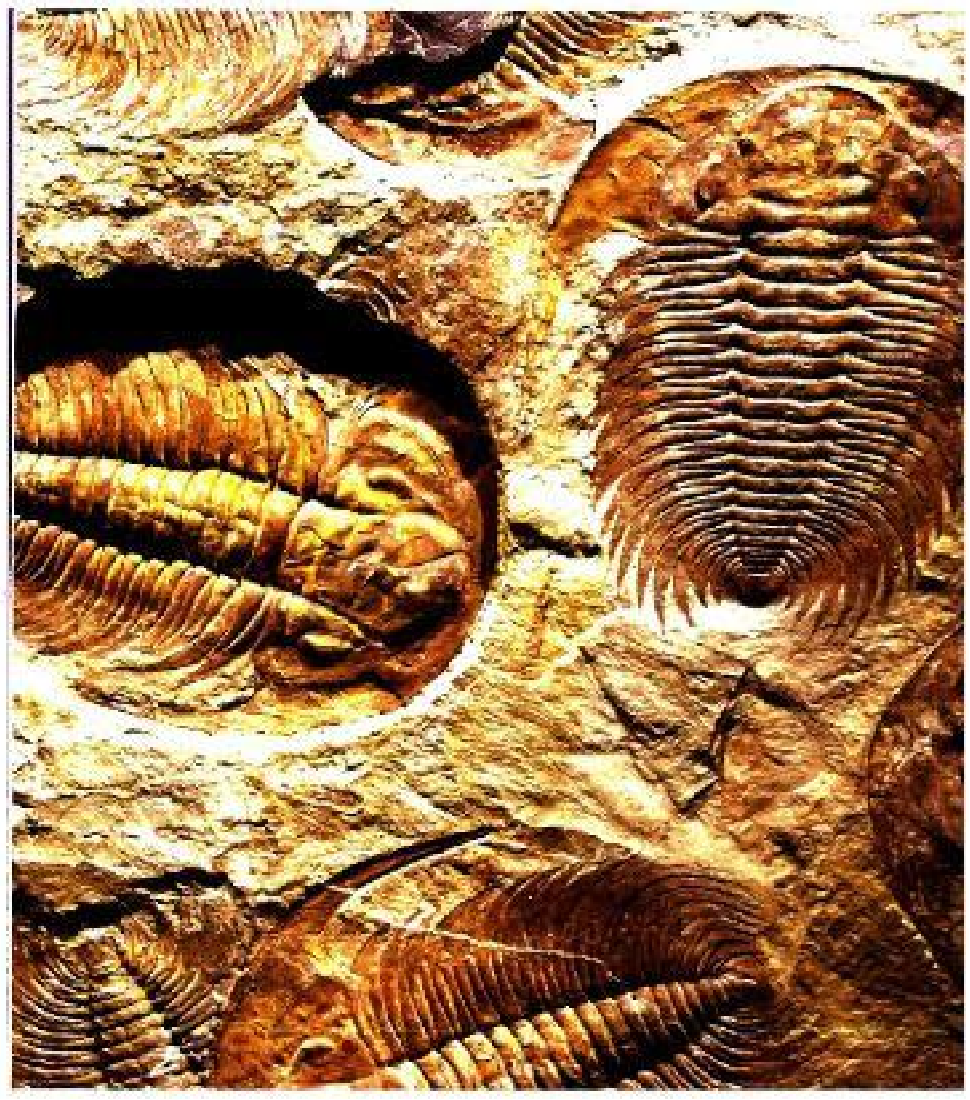
- Recognize the concept of fossil.
- Give different examples of fossils.
- Infer the types of fossils.
- Explain the ways of fossils formation.
- Design a mold of a candle.
- Design models of cast and mold.
- Compare between types of fossils.
- Mention the importance of studying fossils.
- Calculate the age range of some fossils.
- Appreciate the importance of the discovery of fossils in the service of man, environment and society.
- Establish a vision to take responsibility and take personal decisions to protect fossils.
- Collect data and information and expressed their opinion in the protection of fossils and their scientific and social importance.



- Use research skills and inquiry in the study of fossils.
- Define the concept of extinction.
- Use fossils to indicate extinction of some types of organisms.
- Conclude the factors that cause extinction of some types of living organisms.
- Give examples of extinct and endangered species.
- Understand the effect of extinction on ecological equilibrium.
- Suggest new solutions to protect living organisms from extinction.
- Deal gently with organisms and in a civilized manner with the environment.
- Act consciously with the environment and appreciate the importance of normal life.
- Appreciate the role of scientists in protecting living organisms from extinction.
- Use life skills in the study of extinction and protection of living organisms from extinction.
- Write a scientific report on the causes of extinction of some organisms.
- Continue and express their views and discuss with their colleagues and the teacher about ways to protect living organisms from extinction.
- Appreciate the greatness of God in the creation of living organisms.

Lesson 1

Fossils



How can you study life evolution on the planet Earth ?



If you organize a trip to the Geological museum at the River Nile bank in Zahraa El Maady, you will observe the presence of fossils there.

In this lesson, we will study :

- Concept of fossils.
- Types of fossils and their formation.
- Importance of fossils.

Concept of fossils

- Fossils are considered as an exciting world (a story told by sedimentary rocks), that tell us about the deep past, millions years ago even before the creation of man on the Earth.

Fossils:

They are traces and remains of old living organisms that are preserved in sedimentary rocks.

- What is the meaning of trace and remains ?

Trace:

It is the traces of an old living organism that indicate its activity during its life.

※ **Examples :**

Worms' tunnels



Dinosaur's foot print



Remains:

They are the traces that indicate the remains of an old living organism after death.

※ **Examples :**

Remains of a shark's teeth



Remains of a dinosaur's skull



▸ Enrichment information

- *In Latin, the word fossil means something buried in the Earth.*
- *The science, which studies fossils is called "Paleontology".*

Types of fossils

Fossils are classified according to the way of formation (or preservation) into several types, among them are :

1. Fossil of a complete body
2. Mold
3. Cast
4. Petrified fossils

1 Fossil of a complete body

It is a type of fossils, which was formed as a result of the rapid burying of the organism as soon as it died in a medium that preserves it from decomposition as **snow** or **amber**.

– *A complete body fossil :*

It is a fossil that keeps the whole shape and all the details of the body of the living organism as a result of its rapid burying as soon as it died in a medium that preserves it from decomposition.

*** Examples of a complete body fossil :**

A Mammoth fossil :

- Mammoth (a type of elephants) was extinct by the snow avalanche occurred in Siberia 25000 years ago.
- The **first mammoth fossil,** which was discovered last century, and it keeps the whole shape, hair, flesh and food in its bowel.

B Amber fossil :

- During some old geologic ages, there were common ***pine trees***, which secreted **resinous matter** that changed after its solidification into amber.

– *Amber:*

It is the solidified resinous matter, which was secreted by pine trees in old geologic ages.

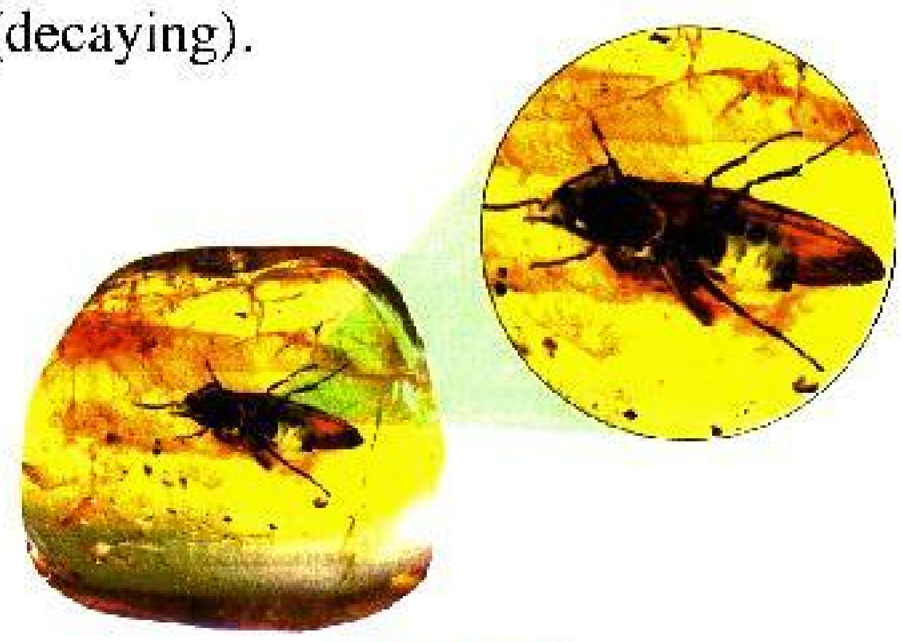
Way of formation :

- After its death, mammoth rapidly buried in **snow** which preserved its body from decomposition.

- Insects were covered by the resinous matter which solidified and changed into **amber** that preserved the bodies of insects buried inside it from decomposition (decaying).



Mammoth fossil



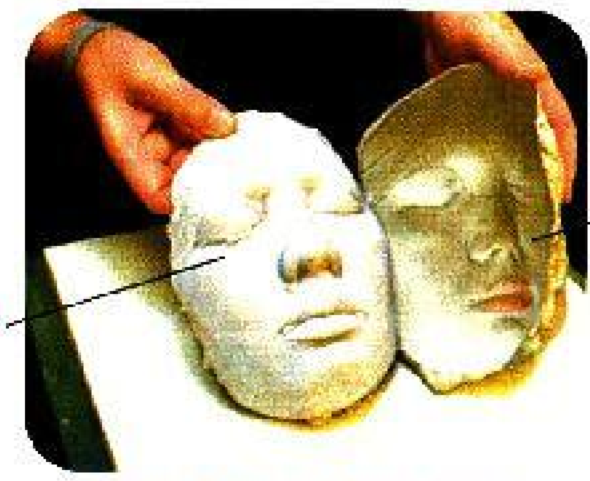
Amber fossil

G.R. ***Amber is considered as a suitable medium for the formation of complete body fossils.***
Because it preserved the bodies of insects inside it from decomposition.

2 Mold

In the opposite figure :

The face pattern that carries the internal details of a face mask is known as a mold.



A mold for a face mask

- Before studying the mold fossils, we must know how to make a model of a solid mold.

Activity 1 Making a model of a solid mold :

Materials and tools :

- Plaster of paris.
- Water.
- Brush.
- Food oil.
- Plastic container.
- Metal mold (or a silicon mold).
- Rod for stirring.

Procedures	Figure	Observation
1. Paint the internal surface of the metal mold (or the silicon mold) with oil using the brush.		- The details formed on the surface of the plaster are the same details of the internal surface of the metal mold.
2. Mix plaster of paris with water and continue stirring to make suitable mixture.		
3. Pour the mixture in the metal mold and wait until the plaster of paris solidifies.		
4. Separate the hard mixture from the metal mold.		

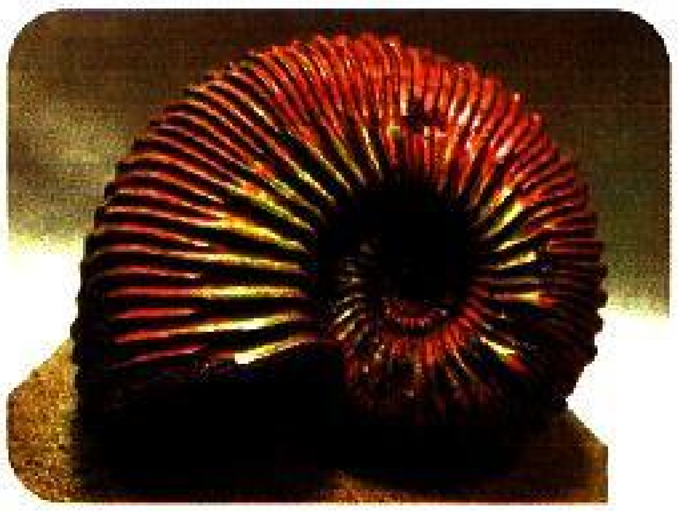
Conclusion:

A replica of the internal shape of metal mold is formed and it is known as **"Solid mold"**.

Solid mold fossil:

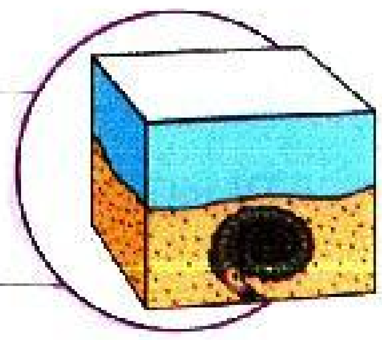
It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks.

✻ Examples of solid mold fossils :

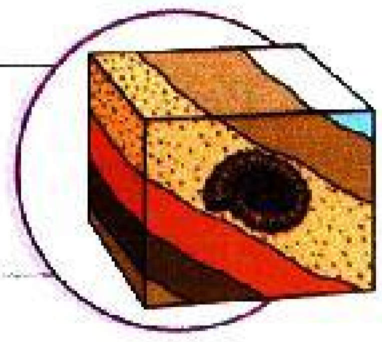
Ammonites fossil	Nummulites fossil	Trilobite fossil
		

How is the solid mold fossil formed ?

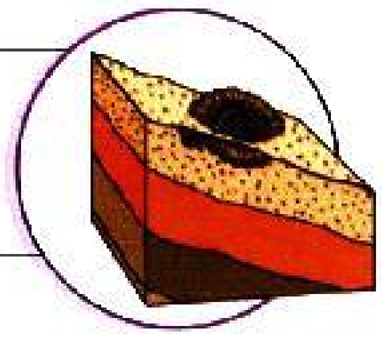
1 When a snail (or clam) dies, it falls on the sea floor, where its soft parts decompose leaving the shell which is buried in sediments.



2 The sediments fill up the shell cavities and solidify as the time passes.



3 The shell decomposes completely, leaving a solid rock mold carrying the internal details of the snail.



Real Life application : *A Candle mold*



- Melt a piece of paraffin wax or wax remains in a water bath.
- Roll a piece of strong paper in the form of a cylinder, then put it in an empty yoghurt can, then pass a thick thread through the cylinder using a needle.
- Pour the melted wax in the cylinder keeping the thread in the middle all time.
- Remove the paper from around the wax after its solidification and put the candle in a suitable glass saucer.

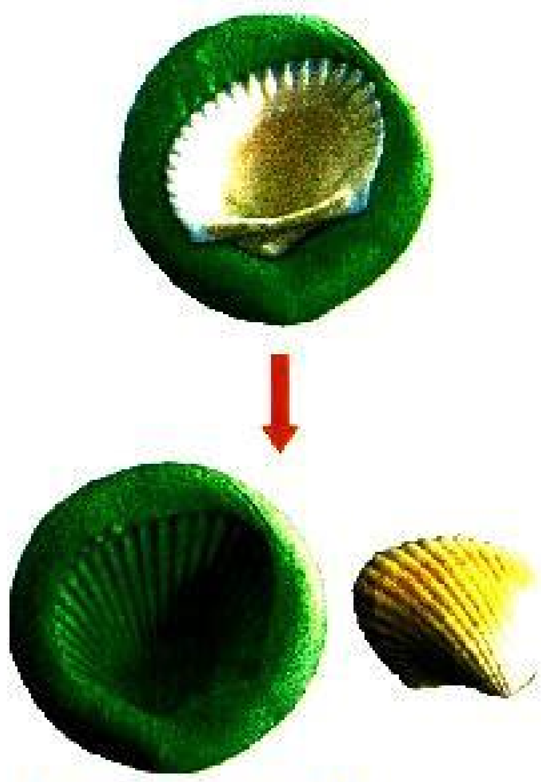
3 Cast

To know what is meant by cast, we must carry out the following activity :

Activity (2) Making a model of a cast :

Materials and tools :

- Coloured clay.
- A shell of clam.

Procedures	Figures	Observation
1. Press on the clay by your hand to make a plane surface.	 A cast for a shell	- The details formed on the clay are the same details of the external surface of shell.
2. Put the shell on the surface of the clay and press it gently.		
3. Remove the shell from the clay.		

Conclusion:

A replica of the original external shell shape is formed and it is known as "**Cast**".

Cast fossil :

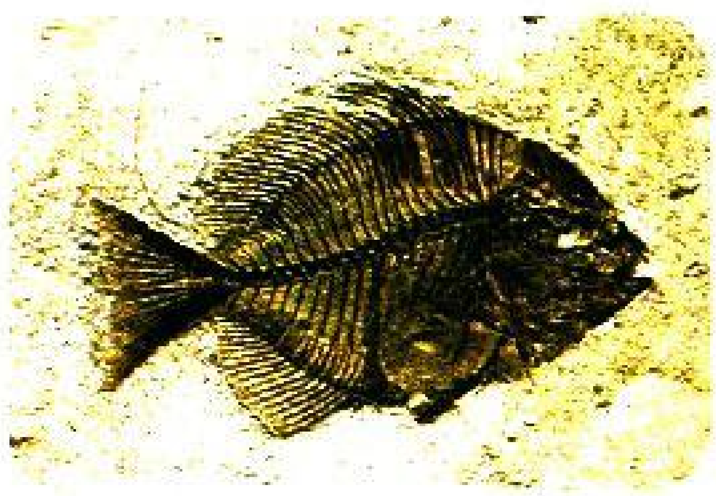
It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks.

*** Examples of cast fossils :**

Cast of ferns



Fish cast



Note

In the sedimentary rocks, mold or cast can be formed for an old living organism after its death.



Trilobite fossil

Comparison between a mold and a trace :

Mold	Trace
- It is the replica of the internal details of the structure of an old living organism leaving them in the sedimentary rocks after death.	- Traces that indicate an activity of an old living organism leaving them in sedimentary rocks during its life.
- Ex.: Ammonites fossil.	- Ex.: Dinosaur's foot print.

Question

Choose the correct term (cast - mold - trace) of each of the following fossils :


1. Fossil .... of ferns.


2. Fossil .... of worms' tunnels.


3. Fossil .... of trilobite.

4 Petrified fossils

Petrified fossils:

They are fossils in which minerals replace the organic matter of an old living organism, after its death, part by part leaving the shape without any change.

Petrification:

It is the process of conversion of the parts of old living organisms to rocky materials as a result of replacing the organic material of the organism with minerals, part by part.

*** Examples of petrified fossils :**

Petrified dinosaur's tooth	Petrified dinosaur's eggs	Petrified wood
		

Petrified woods:

They are fossils which are formed as a result of replacing the wood material of trees with minerals such as silica, part by part, giving us details about the life of an old plant.



How is the petrified wood formed ?

1. The stems and trunks of trees that are more than 35 million years of age were buried in certain environmental conditions.
2. The minerals replaced the wood material (organic matter) part by part, and this is known as **"Petrification"**.
3. By passing time, the wood changes into rocks, which carry the same details of wood without change.



G.R. ***Petrified woods are considered as fossils although they look like rocks.***
Because they give us the details about the life of an old plant.

Note

The area of petrified forests in Qattamiya is called the wood mountain G.R.
Because it contains petrified woods, which look like rocks.

▸ **Enrichment information**

An Egyptian dinosaur has been discovered in Bahariya Oasis, Giza governorate and parts of it are being displayed in the Egyptian Geological Museum.

Suitable conditions for fossils formation (or preservation) :

First

Presence of hard skeleton of organism.

Second

The body of the organism must be buried immediately after death in a medium that preserves it from decomposition.

Third

The existence of a suitable medium, in which the mineral material of rocks replaces the organic material of the living organism.

TRY to answer worksheet 17 in the Notebook

Importance of fossils

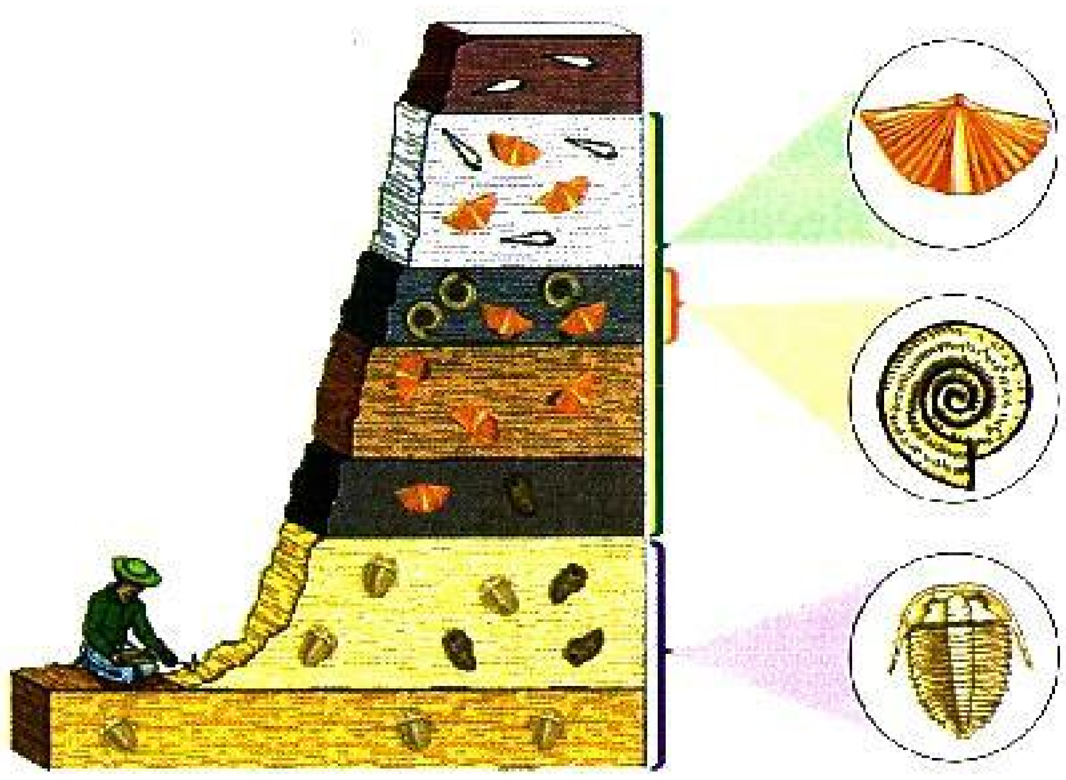
Fossils are important, because they help in :

1. Age determination of sedimentary rocks
2. Figuring out the paleoenvironment
3. Studying life evolution
4. Petroleum exploration

1 Age determination of sedimentary rocks

The scientists notice that :

The lower layers of sedimentary rocks have fossils, whose relative age is greater than that of the fossils of the upper layers, these fossils are known as index fossils.



Index fossils:

They are fossils of organisms that had lived for a short period of time in the past and had a wide geographical range distribution, then became extinct.

G.R. ***Index fossils indicate the age of sedimentary rocks existed in them.***
Because the age of rocks is the same age of fossils existed in them.

2 Figuring out the paleoenvironment

Fossils give us an idea about the environment, in which they lived during the old geologic ages, therefore they indicate the climate of these ages.

*** Examples :**

1 **Nummulites fossils :**

They are found in the limestone rocks of El-Mokattam mountain and they indicate that this area was a sea floor more than 35 million years ago.



2 **Ferns fossils :**

They indicate that the environment, where they lived was a hot and rainy tropical environment.



3 **Coral fossils :**

They indicate that the environment, where they lived was clear warm shallow seas.



Question

Put (✓) or (✗) :

1. Ammonites fossils are found in the limestone rocks of El-Mokattam mountain. ( )
2. Index fossils indicate the age of sedimentary rocks. ( )
3. Ferns fossils indicate that the environment where they lived was a sea floor. ( )

Give reason for :

Index fossils are called by this name.

3 Studying life evolution

Fossil record:

The sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.

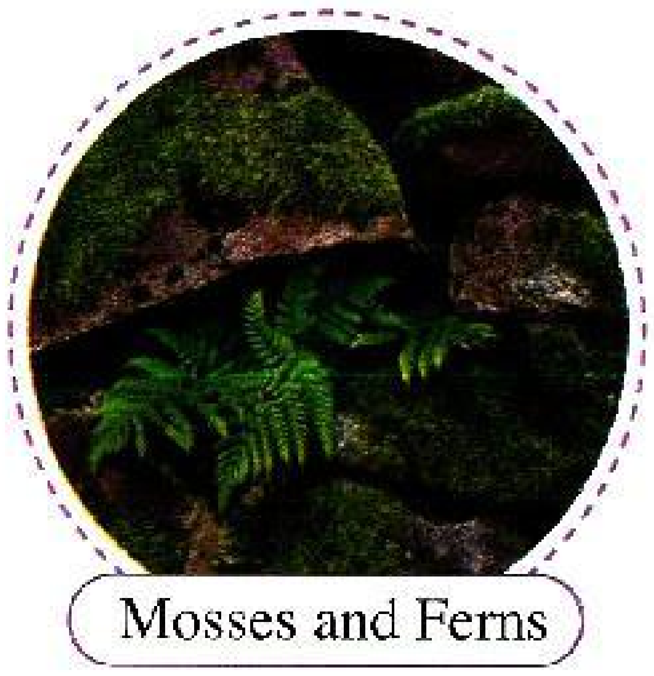
Studying the fossil record showed that :

1. Life started first in sea then established on land.
2. Organisms always developed from simple to complicated.

A In plant world



appeared before





appeared before



Question

1. Complete the following statements :

1. By studying the fossil record, it shows the .... started first in .... then established on ....
2. .... had appeared before ferns, while gymnosperms appeared before .... plants.

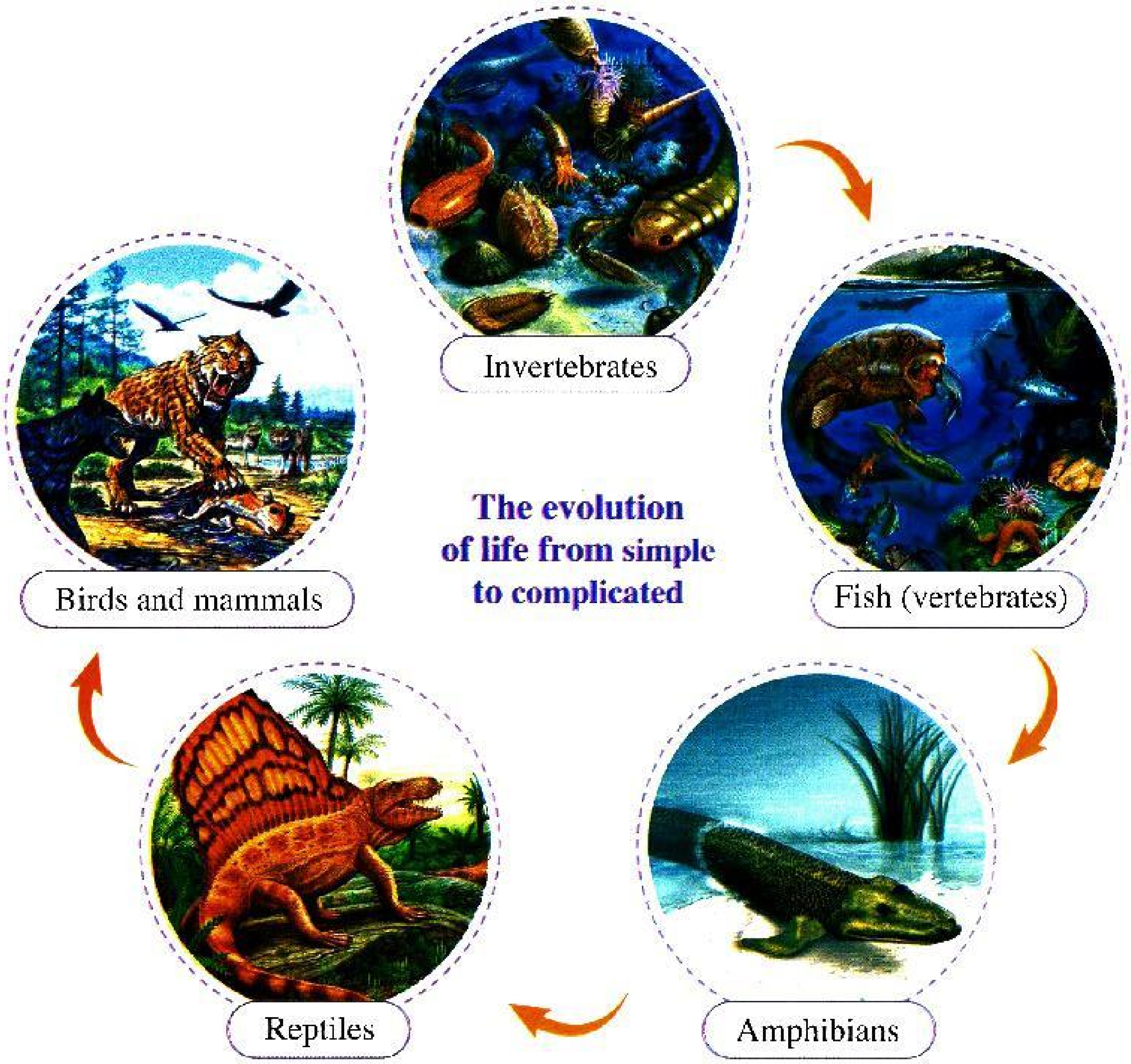
2. Write the scientific term of each of the following :

1. Fossils of organisms that had lived for a short period of time in the past and had a wide geographic distribution.
2. Fossils indicate that the environment where they lived was clear warm shallow seas.

B In animal world

- **Invertebrates** like (corals and mollusks with shells) appeared before **vertebrates**.
- **Fish** were the first vertebrates that appeared followed by **amphibians** then **reptiles** and finally, **birds and mammals** appeared together.

*** As in the following figure :**



Note

Archaeopteryx fossil is considered a link between reptiles and birds.



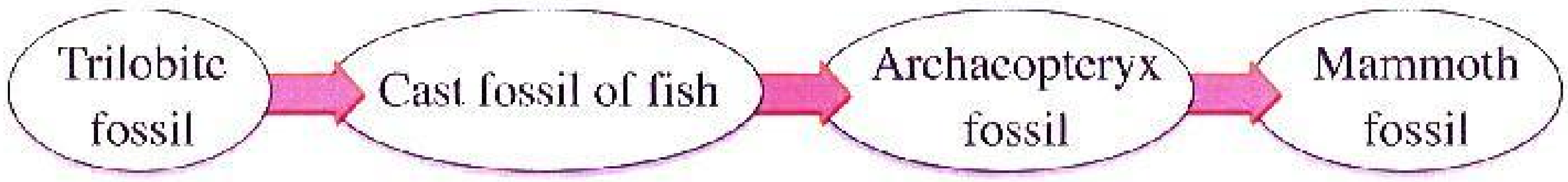
Archaeopteryx fossil

Exercise

Arrange the following fossils starting with first appearance on the life stage and explain your answer.

[Cast fossil of fish - Mammoth fossil - Trilobite fossil - Archaeopteryx fossil]

Answer

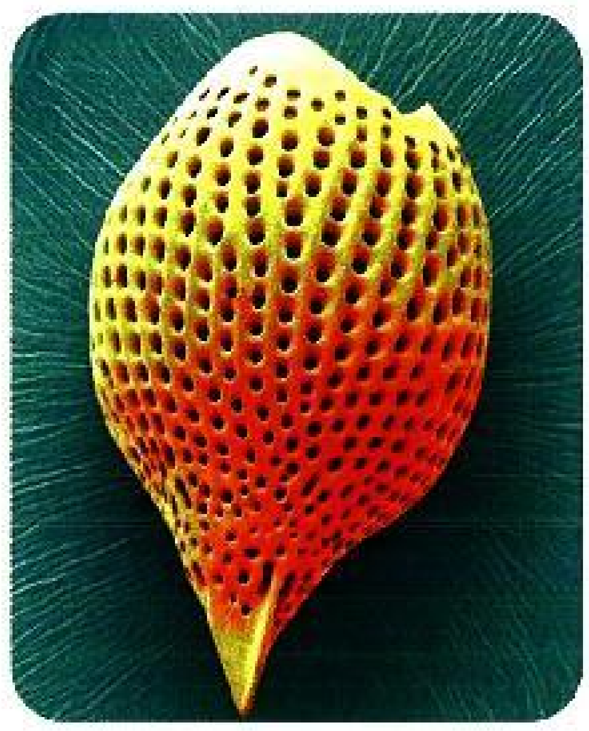


- **Trilobite** is from invertebrates that appeared in seas.
- **Fish** were the first vertebrates that appeared.
- **Archaeopteryx** links between reptiles and birds which appeared after fish.
- **Mammoth** is from the mammals that appeared after reptiles.

4 Petroleum exploration

- When searching for petroleum, geologists take samples from the rocks of the exploratory wells.
- These samples are studied under microscope. If they contain microfossils like **foraminifera** and **radiolaria, this could point to :**
  - The age of rocks existed in exploratory wells.
  - The suitable conditions of petroleum formation.


Enlarged foraminifera fossil


Enlarged radiolaria fossil

TRY to answer worksheet **18** in the Notebook

Remember

Lesson One

Fossils :

They are traces and remains of old living organisms that are preserved in sedimentary rocks.

Trace :

It is the traces of an old living organism that indicate its activity during its life.

Examples : Worm's tunnels – Dinosaur's foot print.

Remains :

They are the traces that indicate the remains of an old living organism after death.

Examples : Remains of a shark's teeth – Remains of a dinosaur's skull.

Types of fossils are :

A. A complete body fossil :

It is a fossil that keeps the whole shape and all the details of the body of the living organism as a result of its rapid burying as soon as it died in a medium that preserves it from decomposition.

Examples : Mammoth fossil - Amber fossil.

B. Solid mold fossil :

It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks.

Examples : Ammonites fossil – Nummulites fossil – Trilobite fossil.

C. Cast fossil :

It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks.

Examples : Cast of ferns – Fish cast.

D. Petrified fossil :

They are fossils in which minerals replace the organic matter of an old living organism, after its death, part by part leaving the shape without any change.

Examples : Petrified dinosaur's tooth and eggs – Petrified wood.

Petrified woods :

They are fossils which are formed as a result of replacing the wood material of trees with minerals, such as silica part by part, giving us details about the life of an old plant.

Petrification :

It is the process of conversion of the parts of old living organisms to rocky materials as a result of replacing the organic material of the organism with minerals, part by part.

Fossils are important, because they help in :

1. Age determination of sedimentary rocks :

Index fossils : They are fossils of organisms that had lived for a short period of time in the past and had a wide geographical range, then became extinct.

⇒ **Index fossils :** indicate the age of sedimentary rocks existed in them.

2. Figuring out the paleoenvironment :

Examples :

- **Nummulites fossils** are found in the limestone rocks of El-Mokattam mountain and they indicate that this area was a sea floor more than 35 million years ago.
- **Ferns fossils** indicate that the environment, where they lived was a hot and rainy tropical environment.
- **Coral fossils** indicate that the environment, where they lived was clear warm shallow seas.

3. Studying life evolution :

Fossil record : The sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.

⇒ **Archaeopteryx fossil** is considered a link between reptiles and birds.

4. Petroleum exploration :

Microfossils like **foraminifera** and **radiolaria** indicate :

- The age of rocks existed in exploratory wells.
- The suitable conditions of petroleum formation.

Questions ? on lesson one

● Remember ● Understand ● Apply ●● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. 📖 Fossils are often found in .... rocks.

   a. metamorphic b. sedimentary c. igneous d. volcanic

2. Worms' tunnels fossil is formed, because of ....

   a. the presence of hard skeleton.

   b. the activity of worms during their life.

   c. the death of the worms and quickly buried in sedimentary rocks.

   d. the death of the worms and quickly buried in ice layers.

3. The complete body fossil of mammoth is found preserved in ....

   a. amber. b. snow. c. sedimentary rocks. d. ocean.

4. 📖 Complete body fossils of insects are found preserved in ....

   a. ammonites. b. amber. c. igneous rocks. d. ambergris.

5. On the solidification of the resinous matter secreted by pine trees in the old geological periods, it forms ....

   a. ammonites fossil. b. amber fossil.

   c. trilobite fossil. d. nummulites fossil.

6. Ammonites fossil represents a mold of a/an ....

   a. snail. b. elephant. c. insect. d. scorpion.

7. If you are a collector of shells of snails and clams on the beach of the sea. Which of the following can you make a model for a fossil known as a mold ? ....

   a. A shell of ammonites snail only.

   b. A shell of clam only.

   c. A shell of ammonites snail and clam together.

   d. These shells are not suitable for making a fossil.

8. What's the kind of fossil that is formed when a plant leaf falls on a soft sedimentary rock at the beginning of formation then hardening ? ....

   a. A trace. b. A mold. c. A cast. d. A petrified fossil.

9. When mud fills up the shell cavities and solidify, then shell decomposes, ... is produced.
a. a solid mold b. a cast c. a petrified wood d. an amber fossil.

10. Is the cake considered as a solid mold, why ? ....
a. Yes, because it carries the same external details of the mold.
b. Yes, because it carries the same internal details of the mold.
c. No, because it carries the same internal and external details of the mold.
d. No, because it doesn't carry any details of the mold.

11. To obtain a fossil of any organism, all the following can expect to be available for it except that it ....
a. has a hard skeleton. b. has a medium protects it from decomposition.
c. rapidly burying after death. d. has a soft body.

12. Fossils are important for all the following except ....
a. determination of sedimentary rocks age.
b. studying the kinds of metals.
c. petroleum exploration.
d. figuring out the paleoenvironment.

13. Are the dinosaur's eggs considered as examples of petrified fossils ? ....
a. Yes, because minerals replace whose organic matter part by part.
b. Yes, because they carry the internal details of the eggs.
c. No, because they aren't considered as fossils.
d. No, because they show the remains of dinosaur after its death.

14. What happened when minerals such as silica replaced the wood of the tree's stems and trunks, which are older than 35 million years ? ....
a. A complete body fossil has been formed.
b. A petrified fossil has been formed.
c. A trilobite fossil has been formed.
d. A dinosaur tooth fossil has been formed.

15. .... fossils are the fossils of organisms that had lived for a short period of time in the past and had a wide geographical range, then became extinct.
a. Petrified b. Index c. Ferns d. Coral

16. Not all the fossils are considered as index fossils and that is because index fossils are characterized by ....
a. long range of time and limited geographical range.
b. short range of time and wide geographical range.
c. long range of time and wide geographical range.
d. short range of time and limited geographical range.

17. .... fossils are found in the limestone rocks of El-Mokattam mountain.

    a. Ferns b. Coral c. Nummulites d. Index

18. .... fossils indicate that the environment where they lived was a hot and rainy tropical environment.

    a. Ferns b. Coral c. Nummulites d. Archaeopteryx

19. Life started first in ....

    a. mountain tops. b. rivers. c. Earth. d. seas.

20. .... is one of invertebrates that appeared in seas.

    a. Mammoth b. Archaeopteryx
    c. Fish d. Trilobite

21. The first vertebrate appeared on the Earth is/are ....

    a. man. b. birds. c. fish. d. reptiles.

22. Archaeopteryx represents a link between ....

    a. vertebrates and invertebrates. b. reptiles and birds.
    c. fish and amphibians. d. amphibians and reptiles.

23. The fossil record points to the life evolution in plants from simple to complicated higher forms, and the evidence for that is ....

    a. angiosperms preceded gymnosperms.
    b. ferns preceded mosses.
    c. algae preceded mosses and ferns.
    d. mosses preceded ferns.

24. Which of the following is considered as the evolution of vertebrates ? ....

    a. Fish ⟶ amphibians ⟶ mammals ⟶ reptiles.
    b. Ferns ⟶ amphibians ⟶ reptiles ⟶ birds.
    c. Fish ⟶ amphibians ⟶ birds ⟶ mammals.
    d. Fish ⟶ amphibians ⟶ reptiles ⟶ mammals.

25. .... is an example of microfossils.

    a. Mammoth b. Fern c. Foraminifera d. Archaeopteryx

26. Which of the following fossils play an important role in petroleum exploration ? ....

    a. Foraminifera and radiolaria. b. Nummulites and ammonites.
    c. Foraminifera and trilobite. d. Radiolaria and nummulites.

2. Choose from column (B) what suits it in column (A) :

(1)

(A)	(B)
1. Mammoth 2. Ammonites 3. Petrified wood	a. is a cast fossil. b. is a mold fossil. c. became extinct 25 thousands years ago. d. is 150 million years in age. e. is found in Qattamiya.

(2)

(A)	(B)
1. Corals 2. Ferns 3. Nummulites 4. Archaeopteryx	a. is a link between reptiles and birds. b. is 400 million years of age. c. indicate the evolution from simple to complicated life. d. are fossils that indicate that the environment where they lived was a hot and rainy tropical. e. are fossils that indicate that the environment, where they lived was clear warm shallow seas. f. are fossils, whose age is more than 35 million years.

3. Correct the underlined words :

1. The trace is what the living organism leave after its death in the sedimentary rocks.
2. The archaeopteryx fossil is a kind of extinct elephants.
3. The first discovered fossil of mammoth was found preserved in amber.
4. The amber is a solidified colloidal matter that protects the insects inside it from decomposition.
5. Snail shell decomposes after the sediments fill its cavities, leaving a rocky cast carrying the internal details of the snail.
6. The mold is a copy of the outer shape of the shell.
7. Petrified wood is considered as rocks.
8. Dinosaur's eggs and dinosaur's tooth are examples of cast fossils.
9. Nummulites fossils indicate the age of sedimentary rocks.
10. The ammonites fossil indicates that the environment, where it lived was warm, clear and shallow seas.
11. Ammonites fossils are found in the limestone rocks of El-Mokattam mountain.
12. Ferns fossils indicate that the environment where they lived was a sea floor.
13. The fossil record points to reptiles as the first appeared vertebrates.
14. Mammoth represents a link between reptiles and birds.
15. Foraminifera and archaeopteryx are microfossils that are useful in petroleum exploration.

4. Write the scientific term of each of the following statements :

1. Remains or traces of organisms that lived in the past and were preserved in sedimentary rocks.
2. Traces that indicate the activity of once an old living organism during its life.
3. Traces that indicate the remains of once an old living organism after death.
4. A fossil that keeps the whole shape and all the details of the body of the living organisms as a result of its rapid burying as soon as it died in a medium that preserves it from decomposition.
5. The solidified resinous matter, which was secreted by pine trees during old geologic ages.
6. A copy of the original internal details of a skeleton of an old living organism.
7. A replica of the external details of a skeleton of an old living organism.
8. The fossils which are formed as a result of replacing the wood material of trees with minerals, part by part, giving us details about the life of an old plant.
9. Replacing part by part, the wood material of trees by minerals to form petrified woods.
10. Remains of old organisms that lived in the past for a certain period, then became extinct.
11. The sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.

5. Complete the following statements :

1. Fossils are traces and remains of .... organisms that are preserved in .... rocks.
2. .... indicate the activity of an old living organism during its life, while .... indicate the remains of once an old living organism after death.
3. .... and .... are examples of traces of an old living organism.
4. .... and .... are examples of remains of an old living organism after death.
5. The fossils types differ according to their way of ....
6. Fossils are classified according to the ways of formation into fossil of a complete body, ... , ... and ....
7. The suitable medium to form a mammoth fossil is ....
8. The complete body fossil of .... animal was discovered in the .... of Siberia and indicated that the animal lived 25000 years ago.
9. .... trees secrete resinous matter, which changes into .... after its solidification, and it protects the insect buried in it from ....
10. .... and .... are examples of solid mold fossils.
11. .... and .... are examples of cast fossils.

12. The replica of the internal details of a skeleton of once an old living organism is called .... ,while that of the external details is called ....
13. When the snail's shell decomposes, it will leave .... which carries the internal details of the snail.
14. Minerals such as .... replaces wood material part by part in the .... wood fossils.
15. In petrified fossils, minerals replace the .... matter of organism part by part leaving the .... without any change.
16. .... and .... are from examples of petrified fossils.
17. The area of petrified forests in Qattamiya is known as ...., because it contains .... which look like rocks.
18. Fossils are important for studying .... and figuring out the ....
19. .... fossils indicate the age of .... rocks.
20. There are .... fossils in the .... rocks, which form El-Mokattam mountain.
21. Ferns fossils indicate that the environment, where they lived was .... and rainy .... environment.
22. Coral fossils indicate that the environment, where they lived was .... warm and .... seas.
23. By studying the fossil record, it shows that the life started first in .... then established on ....
24. .... had appeared before ferns, while gymnosperms appeared before .... plants.
25. .... were the first vertebrates that appeared and followed by ....
26. According to fossil record, ... and mammals appeared together after the appearance of ....
27. Archaeopteryx is the link between .... and ....
28. Fossils are used in .... exploration and determining the age of ....

6. Give reasons for :

1. Mammoth fossil is preserved as a complete body fossil.
2. Amber is considered as a suitable medium for the formation of complete body fossils.
3. Ammonites fossil is classified as a mold fossil.
4. Formation of petrified wood fossils.
5. Naming the petrified forest with wood mountain.
6. Petrified woods are considered from fossils although they look like rocks.
7. El-Mokattam mountain was a part of a sea floor more than 35 million years ago.
8. Nummulites fossils are considered as index fossils.
9. Not all known fossils are considered as index fossils.
10. Fossils are important in petroleum exploration.

7. What is meant by ... ?

1. Fossils.
2. trace.
3. Remains.
4. A complete body fossil.
5. An amber.
6. A mold.
7. A cast.
8. Petrified fossils.
9. Petrified woods.
10. Petrification.
11. Index fossils.
12. A fossil record.

8. Mention an example of each of the following :

1. A trace fossil.
2. Fossil remains.
3. A fossil of complete body.
4. A fossil of cast.
5. A fossil of solid mold.
6. A petrified fossil.
7. Fossils are found in the limestone rocks of El-Mokattam mountain.
8. An organism represents a link between reptiles and birds.
9. Microfossils.

9. Mention the importance of each of the following :

1. Fossils.
2. Index fossils.
3. Nummulites fossils.
4. Coral fossils.
5. Ferns fossils.
6. Fossil record.
7. Foraminifera and radiolaria (or microfossils).

10. What is the difference between ... ?

1. Trace and remains.
2. The mammoth and amber fossils.
3. A cast and a mold.
4. A cast and a trace.
5. A mold and a trace.
6. Coral fossils and ferns fossils.
7. The importance of nummulites fossil and foraminifera fossil.

11. Choose the odd word out, then write the suitable name for others :

1. Cast / Fossil of a complete body / Fossil record / Mold.
2. Trilobite fossil / Nummulites fossil / Fossil of ferns / Ammonites fossil.
3. Fossil of dinosaur's tooth / Fossil of dinosaur's eggs / Nummulites fossil / Fossil of petrified wood.
4. Figuring out the paleoenvironment / Petrified fossils / Studying life evolution / Petroleum exploration.

12. What are the consequences of each of the following ?

1. An organism is buried fast after death in snow.
2. Dipping the old insects in amber.

3. The solidification of the mineral sediments inside a snail, then the decomposition of its shell over millions of years.
4. Putting a clam's shell on the surface of a flat piece of clay and pressing it gently.
5. Minerals replace wood material part by part of an old tree.

13. Mention the geological criteria that prove each of the following :

1. The area of El-Mokattam mountain was a sea floor more than 35 million years ago.
2. Evolution of living organisms towards complexity and higher ranking.
3. Environment was a clear warm and shallow seas.
4. Environment was a hot and rainy tropical.
5. Probability that there is petroleum in an area when examining samples from the underground rocks.

14. Variant questions :

- (1) **"Paleontology is the science of studying fossils that tells us about the nature of the deep past before the creation of man".**
  a. What is the concept of fossils ?
  b. Mention the types of fossils.
- (2) **"Amber preserves organisms in a complete shape without decomposition".**
  a. How is amber produced ?
  b. What is the type of organisms that is preserved in amber ?
  c. Why do not living organisms bodies decompose when preserved in amber ?
- (3) **Explain how the solid mold fossil is formed.**
- (4) **"You and your classmates visited the petrified forests protectorate in Qattamiya and you have seen the petrified woods".**
  a. What is the age of the trees that form these petrified woods ?
  b. Are these petrified woods fossils or rocks ? Why ?
  c. How were petrified woods formed ?
- (5) **Mention the suitable conditions for fossils preservation.**
- (6) **"Structure of organisms evolves from simple to complicated as the time passes".**
  a. What is the last type of animals that appeared on the Earth ?
  b. What is the type of vertebrate animals that appeared before reptiles ?
  c. What is the name of the fossil that represents the link between reptiles and birds ?

(7) "A researcher discovered microfossils like foraminifera and radiolaria when he investigated samples taken from the rocks of an exploratory well".

What information can be concluded from this discovery ?

(8) "Fossils indicate the paleoenvironments (past environments) where they lived throughout the old geologic ages, and hence the paleoclimate of these ages"

Describe the environment where the following fossillized organisms lived :

a. Ferns. b. Coral. c. Nummulites.

(9) Arrange the following fossils according to first appearance on the life stage :

Mammoth – Cast fossil of fish – Trilobite – Crocodiles.

(10) Which of the following represents a cast or a mold ?

a. Gold alloy.
b. Cubes of ice.
c. Wax museum statues in Helwan.
d. Models of clothes shows.
e. Face of a coin on clay.

15. Look at the following pictures, then answer the questions :

(1) Mention the name and the type of each fossil illustrated in the following figures :


Fig. (a)


Fig. (b)

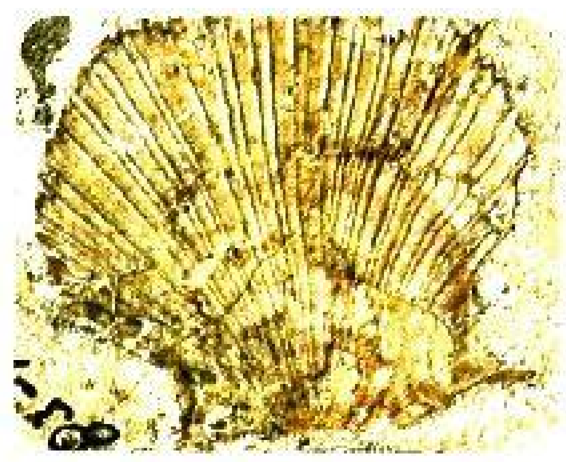

Fig. (c)


Fig. (d)


Fig. (e)


Fig. (f)

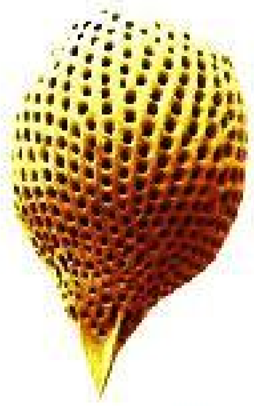
(2) **From the following fossils :**

		
Fig. (a)	Fig. (b)	Fig. (c)

1. Mention the type of fossils (a) and (c).
2. What is the thing which is in common between the fossils (b) and (c) ?
3. **Complete :**

   If the fossil (a) is found in an area, it indicates that this area was ....

(3) **From the following fossils :**

		
Fig. (a)	Fig. (b)	Fig. (c)

1. Mention the name of each of them.
2. What is indicated by the presence of fossils (a), (b) and (c) in an area ?
3. What is the area, in which fossil (c) is found ?

16. Creative thinking :

"Your shoe was casted on a wooden mold resembling the shape of the foot".

Mention as many types of molds as you can that are being used in different purposes around you.

Thinking Skills Questions

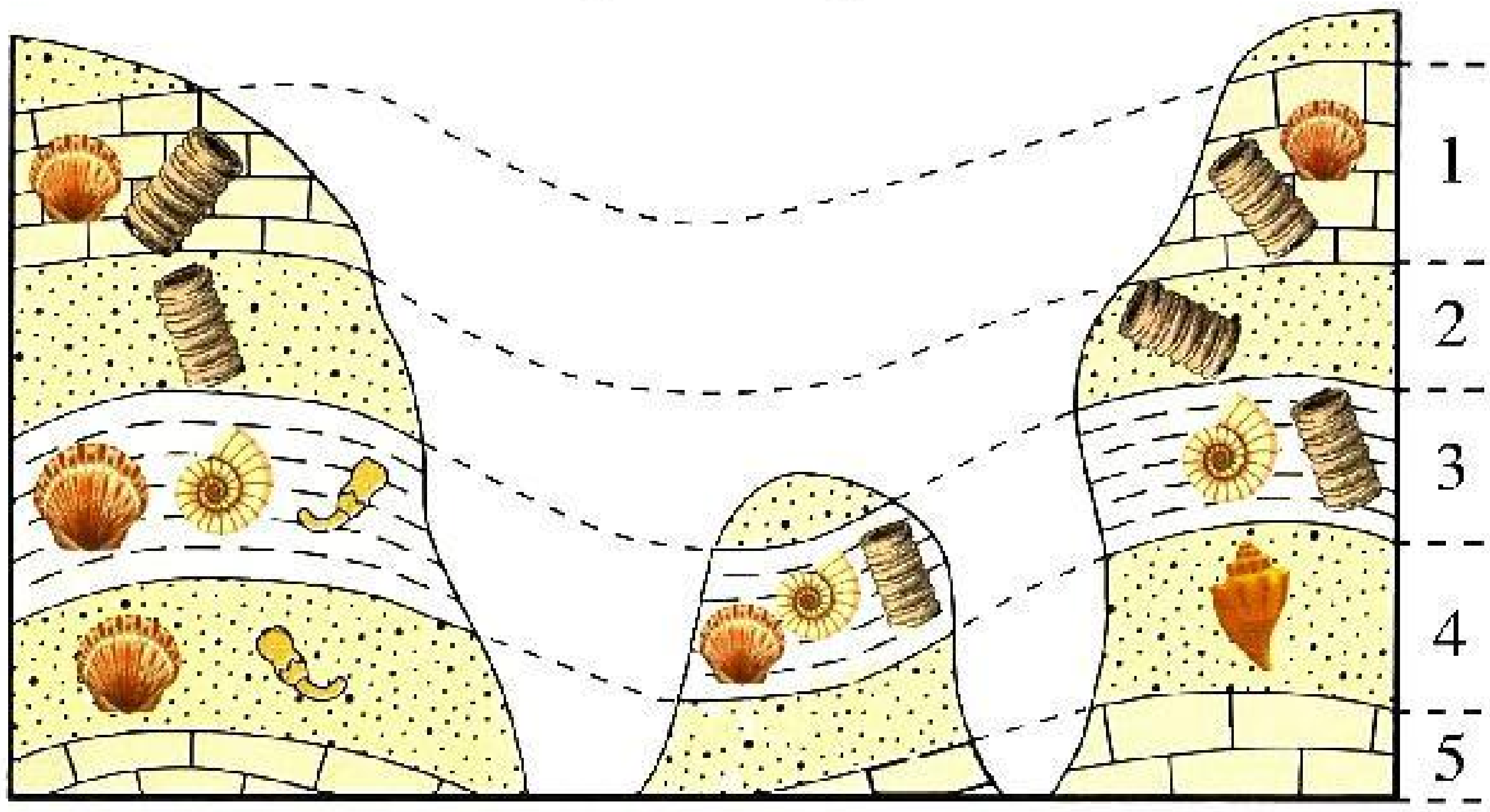
1. Choose the correct answer :

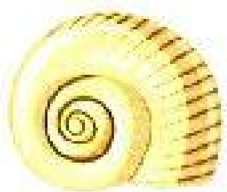
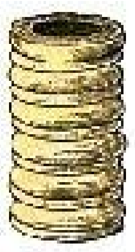
1. Which of the following animals can form solid mold fossil ? ....

(A) (B) (C) (D)

2. In the following figure, there are three rocky regions, each one of them lays far from the other, which one from the following fossils represent an index fossil ? ....



(A) (B) (C) (D)

2. Can we consider dinosaur is a type of mammals ? (Give reasons)

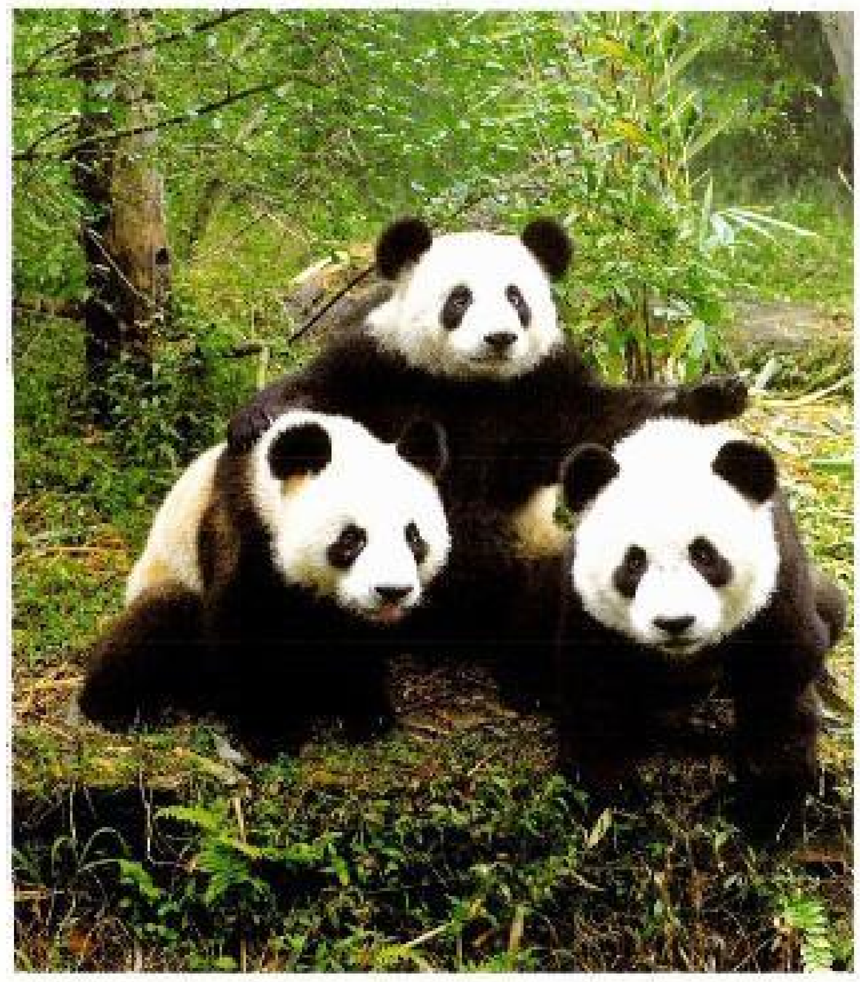
3. Give a reason for : A trilobite fossil and a mammal animal fossil are not found together in one layer of rocks.

4. Arrange the following living organisms in ascending order according to the appearance on Earth : Frog, horse, shark, earth worm, snake.

5. We can't found old fossils between marble (a type of metamorphic rocks), Explain the reasons.

Lesson 2

Extinction



Why are some animals species no longer exist on the planet Earth ?

From your previous studies, you know that living organisms are always in case of equilibrium.
The number of a certain kind of organisms does not exceed the number of another species. The continuous decrease in number of other species without compensation of this decrease in number causes the death of all individuals of this species which is known as **extinction**.



Extinction:

- It is the continuous decrease without compensation in the number of a certain species of living organisms until all members of species die out.
- It is dying out of all members of species of living organisms.

Using fossil record to indicate extinction

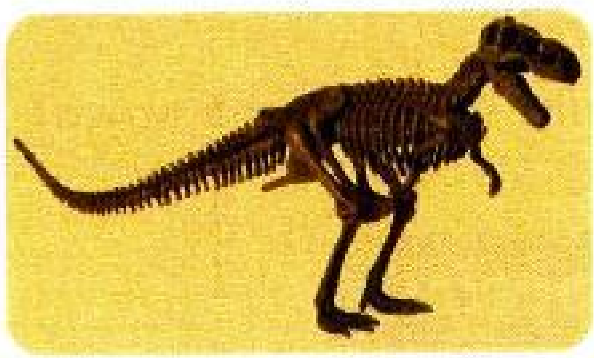
- Fossil record includes the sequence of living organisms fossils which are left in the sedimentary rocks from millions years ago.

- **Fossil record indicates :**

1. The types of living organisms which lived on Earth in different ages.

2. The types of extinct living organisms which lived on Earth in old ages like :

- Dinosaurs



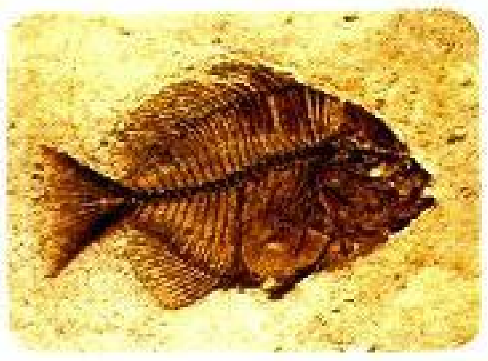
Dinosaur fossil

- Archaeopteryx



Archaeopteryx fossil

- Many types of fish



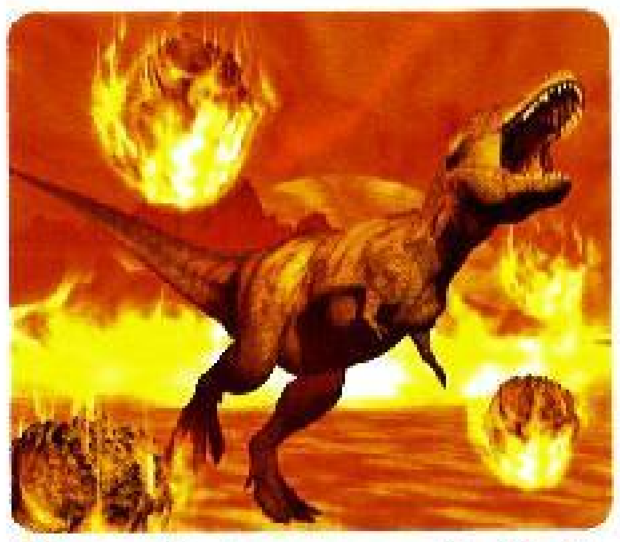
Fish fossil

Reasons of extinction

A Reasons of extinction in old ages [macro extinctions]

Many scientists attributed macro extinctions of some living organisms (like extinction of dinosaurs) due to occurrence of :

1. Meteorite impacts with Earth.
2. The violent Earth movements.
3. Exposure of the Earth to long ice age.
4. Toxic (poisonous) gases which evolved from volcanoes.



Meteorite impacts with Earth causes extinction of dinosaurs

B Reasons of extinction in recent ages

- Recent extinction occurred now is caused by different factors. Most of them are due to the interference of man with nature such as :

1 Destroying natural habitat



Cutting trees of forests

2 Overhunting



Overhunting

3 Environmental pollution



Death of marine bird due to oil pollution

4 Climatic changes resulted from industrial activities of man and natural disasters



Drought

For illustration

From disasters that are related to climatic changes are :

- *Drought.*
- *Tornadoes.*
- *Forests fires.*
- *Torrents.*
- *Volcanoes.*
- *High marine tide (Tsunami waves).*

The extinct and endangered species

FIRST The extinct species

* Examples of some extinct species in the old times :

Hundred millions of organisms extincted in the old times. The most famous of them are :

1 Dinosaur

- Dinosaur became extinct from millions of years ago.



2 Mammoth

- Mammoth is called the grandfather of recent elephant.



* Examples of some extinct species in the recent times :

1 Dodo bird

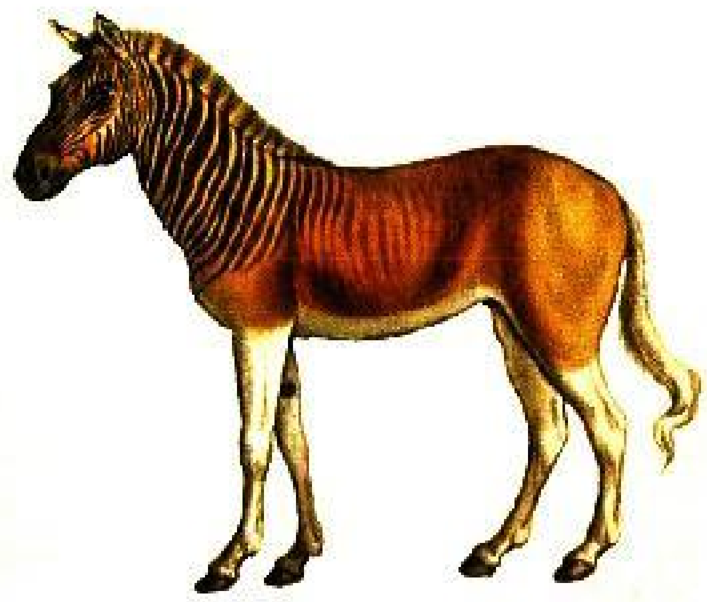
- **It is a non-flying bird G.R.**

Due to the reduced size of its wings so, it is an easy target for hunters.



2 Quagga

- It is a mammal animal.
- It is considered the midway between horse and zebra.



Second The endangered species

* Examples of some endangered species :

There are about 5000 endangered species like :

1 Panda bear



2 Rhinoceros



3 Ibis bird



4 Barbary sheep (Arui)



5 Bald eagle

- **It is called bald G.R.** Because its head is covered with white feathers which make it looks like bald.



6 Papyrus plant

- It is used by pharaohs to manufacture writing papers.



Note

Ibis bird, barbary sheep and papyrus plant are considered from Egyptian environmental organisms.

TRY To Answer Worksheet 19 in the Notebook

Effect of extinction on the ecological equilibrium

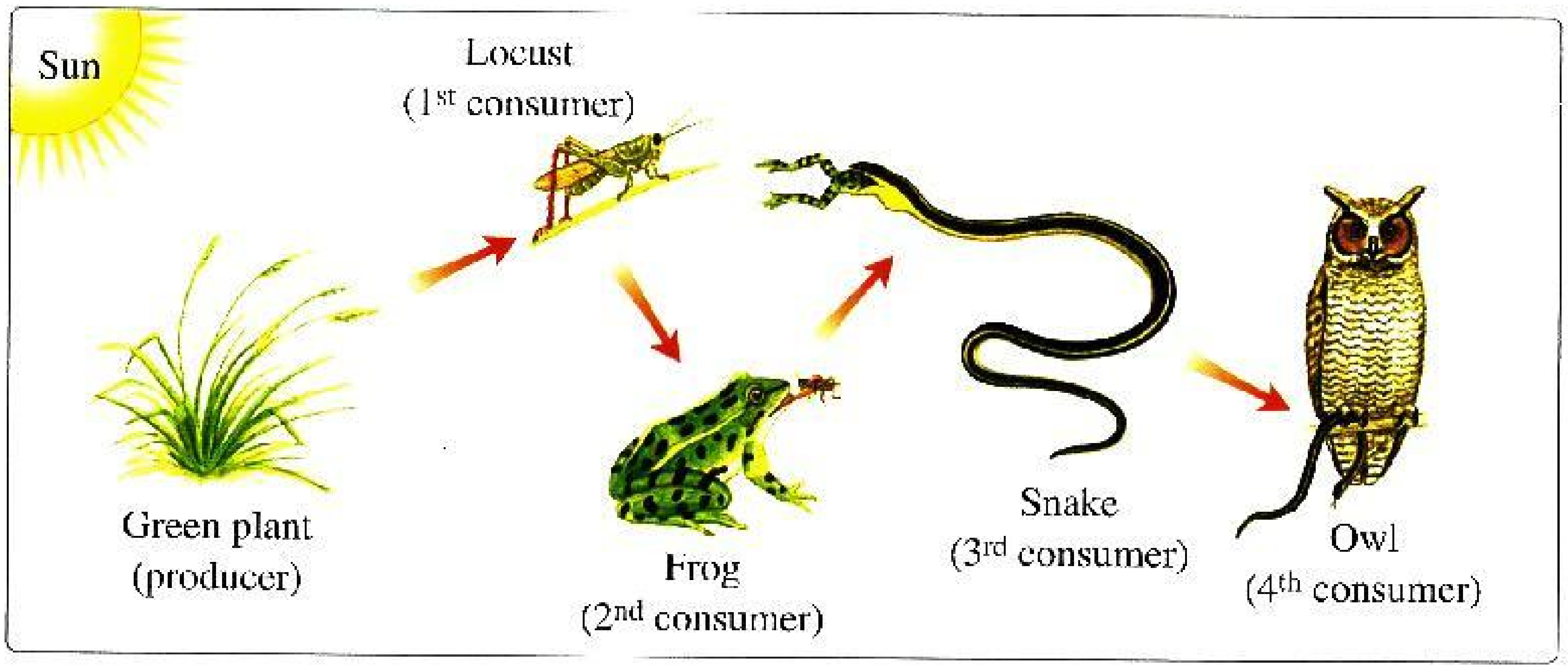
- At any ecosystem, the energy transfers through a path which is known as **food chain**.

Food chain:

It is a path of energy that transfers from a living organism to another in the ecosystem.

- Each living organism has a role in transferring energy throughout the food chain as energy transfers from producers to consumers.

※ As in the following chain :



- Groups of food chains are connected forming **food web**.

Food web:

It is a group of food chains connected with each other.

- The system remains balanced unless one of its members is absent.
- When an organism disappears, its role stops, affecting the rest of members of the food chain or the food web.

Exercise

- The following figure shows a terrestial food chain :

Green plant ➡ Locust ➡ Frog ➡ Snake ➡ Owl

1. What happens in the absence of frogs ?
2. What happens in the absence of snakes ?

Answer

1. Snakes die due to starvation and the number of locusts will increase and destroy the green plants.
2. Owls die due to starvation, so the number of frogs will increase and pounce on the locusts.

"In the two cases, there is a disturbance in the ecosystem"

What are the consequences of ... ?

Extinction of species or a group of species from a balanced ecosystem.

➲ It causes a cavity (cut link) in the path of energy in this ecosystem that would disturb the ecosystem equilibrium or destroy it.

• **Ecosystem is classified according to the degree of the effect of extinction on it into :**

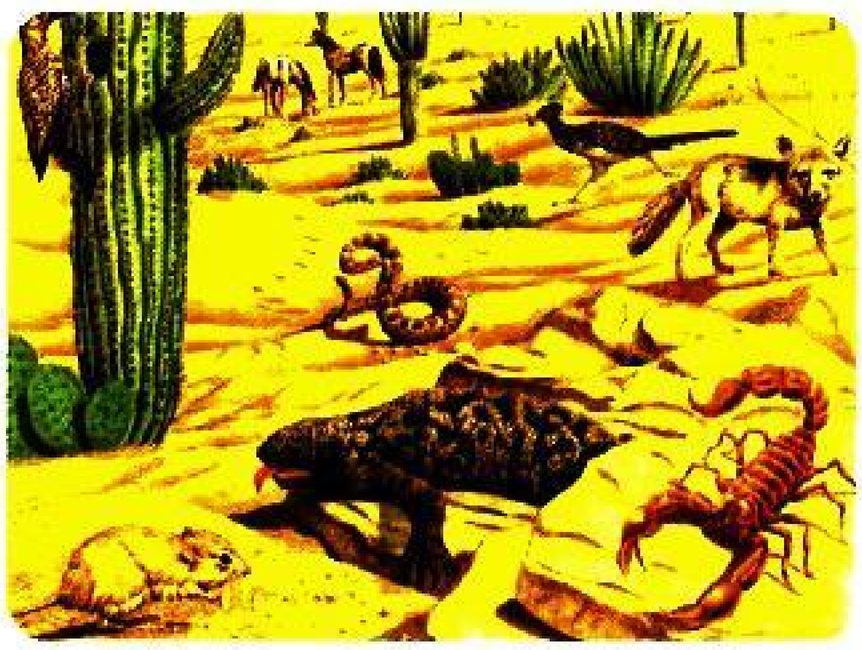
1 Simple ecosystem	2 Complicated ecosystem
Simple ecosystem: It is an ecosystem that has a few members and it is strongly affected by the absence of one of its species.	***Complicated ecosystem:*** It is an ecosystem that has multiple members and it is not affected much by the absence of one of its species.

Characteristics

Simple ecosystem	Complicated ecosystem
- It is characterized by containing a few number of members of living organisms (few members).	**- It is characterized by containing a large number of members of living organisms (multiple members).**
- It is strongly affected by the absence of one of its species **G.R.** Because of the rarity of alternative that compensates this absence.	**- It is not affected much by the absence of one of its species** **G.R.** Because it has many alternatives.

Examples

• **Desert.**



• **Tropical forest.**



Ways to protect living organisms from extinction

- It was necessary for the scientists to think in ways of protection of species endangered by extinction to keep the ecological balance and so the ecological systems from destruction.

*** Ways to protect rare and endangered living organisms :**

1. Putting laws which regulate the process of hunting of living organisms especially the rare types.
2. Increasing awareness about the importance of natural life to sustain the existence of mankind.
3. Breeding and reproducing the endangered species and sending them back to their native habitats.
4. Establishing gene banks for the endangered species.
5. Establishing natural protectorates areas.

Natural protectorates:

They are safe areas established to protect endangered species in their homeland.

*** Importance of natural protectorates :**

Natural protectorates provide the endangered species with suitable conditions for growth and reproduction away from their natural enemies.

The important world's protectorates :

Protectorate	1. Yellowstone protectorate	2. Panda protectorate
Location	USA	Northeastern China.
Protected kinds	Grey bear 	Panda bear 

Egypt's important protectorates :

Protectorate	**1. Ras Mohamed protectorate :** It is the first established protectorate in Egypt in 1983.	**2. Wadi El-Hetan (part of Wadi El-Raiyan protectorate).**
Location	South Sinai governorate.	El-Fayoum governorate.
Protected kinds	Rare species of coral reefs and coloured fish. 	Complete whales'skeleton fossils (40 million years ago). 

G.R. ***Wadi El-Hetan (part of Wadi El-Raiyan protectorate in El-Fayoum) is considered the most important area in this protectorate.***

Because it contains complete whales'skeleton fossils 40 million years ago.

Note

Ras Mohamed protectorate (shaped as a chin).



Enrichment information

Number of natural protectorates that had been established according to the law (number 102 year 1983) is about 30 natural protectorates till 2012 which are found on about 15 % of the total area of Egypt.

TRY to answer worksheet **20**
- General Exercise of the School Book on Unit 3
- Model Exams on Unit 3

in the Notebook

Remember

Lesson Two

Extinction :

It is the continuous decrease without compensation in the number of a certain species of living organisms until all members of species die out.

(or)

It is dying out of all members of species of living organisms.

Among factors causing old (or macro) extinctions are :

1. Meteorite impacts with Earth.
2. The violent Earth movements.
3. Exposure of the Earth to long ice age.
4. Toxic (poisonous) gases which evolved from volcanoes.

Among factors causing recent extinction are :

1. Destroying natural habitat.
2. Overhunting.
3. Environmental pollution.
4. Climatic changes and natural disasters.

Among examples of some extinct species in the old times are :

Dinosaur and Mammoth.

Among examples of some extinct species in the recent times are :

Dodo bird and Quagga.

Among examples of some endangered species are :

Panda bear – Rhinoceros – Bald eagle – Ibis bird - Papyrus plant and Barbary sheep.

Food chain :

It is a path of energy that transfers from a living organism to another in the ecosystem.

Food web :

It is a group of food chains connected with each other.

Ecosystem is classified according to the degree of the effect of extinction on it into :

(A) Simple ecosystem. (B) Complicated ecosystem.

Natural protectorates :

They are safe areas established to protect the endangered species in their homeland.

Ex.: Yellowstone protectorate, Panda protectorate, Ras Mohamed protectorate and Wadi El-Hetan protectorate.

Questions ? on lesson two

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. .... is the continous decrease in number of the same species of living organisms without compensation until all members of species die out.
   a. Food chain b. Extinction c. Food web d. Evolution
2. 📖 .... indicate(s) extinction.
   a. Fossils b. Protectorates c. Evolution d. Ecological equilibrium
3. All the following are from the hypothetical theories that explain the causes of macro extinction except ....
   a. meteorite impacts with Earth. b. poisonous gases emitted by volcanoes.
   c. occurrence of long glacial age. d. overhunting.
4. .... is/are of the most important causes of extinction in recent ages.
   a. Volcanic eruption b. Falling of ice bergs
   c. Falling of meteorites d. Overhunting and environmental pollution
5. 📖 All of the following are natural disasters that threaten living organisms except ....
   a. floods. b. volcanoes. c. drought waves. d. global warming.
6. .... were famous extinct animals in old times.
   a. Dodo bird and mammoth b. Dinosaurs and quagga
   c. Dinosaurs and mammoth d. Grey bear and passenger pigeon
7. From the most common recently extinct species is/are ....
   a. dodo bird only. b. quagga only. c. bald eagle only. d. dodo bird and quagga.
8. .... is considered the midway between horse and zebra.
   a. Quagga b. Dodo bird c. Golden frog d. Tasmanian cat
9. .... is an extinct bird, which was characterized by the reduced size of its wings.
   a. Passenger pigeon b. Dodo bird
   c. Bald eagle d. Ibis bird
10. 📖 All of the following are endangered species except ....
    a. panda bear. b. bald eagle. c. quagga. d. rhinoceros.
11. .... is the path of energy that transfers from a living organism to another.
    a. Food type b. Food pyramid c. Food chain d. Food web
12. 📖 .... protectorate is the first established natural protectorate in Egypt.
    a. Saint Cathrine b. Ras Mohamed c. Wadi El-Hetan d. Petrified forest

13. Yellowstone protectorate, which was established for grey bear is in ....

a. China. b. USA. c. Wadi El-Hetan. d. Ras Mohamed.

14. Ras Mohamed protectorate includes ....

a. some rare fish only. b. whales' fossils only.

c. rare coral reefs only. d. some rare fish and coral reefs.

15. The age of whales' fossils in Wadi El-Raiyan is .... million years.

a. 20 b. 40 c. 60 d. 68

2. Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Dodo bird	a. Is called the grandfather of recent elephant.
2. Mammoth	b. Is considered the midway between horse and zebra.
3. Quagga	c. Became extinct from 66 million years ago.
4. Bald eagle	d. Is a non-flying bird.
	e. Looks like bald.

3. Choose from columns (B) & (C) what suit them in column (A) :

(A)	(B)	(C)
1. Ras Mohamed	a. Panda bear	A. USA
2. Wadi El-Raiyan	b. Grey bear	B. South Sinai
3. Yellowstone	c. Rare coloured fish	C. Fayoum
4. Panda	d. Barbary sheep	D. Sidney
	e. Whales' fossils	E. Northeastern China

4. Put (✓) or (×) , then correct the wrong ones :

1. Protectorates indicate the extinction of species of living organisms. ( )
2. Dodo bird and quagga are from extinct species in the recent times. ( )
3. Papyrus is considered as an extinct plant. ( )
4. Tropical forest is an example of complicated ecosystem. ( )
5. Establishing gene banks and natural protectorate areas are ways to protect living organisms from extinction. ( )
6. Ras Mohamed protectorate is the first established protectorate in Egypt in 1983. ( )
7. Yellowstone protectorate is found in northeastern China. ( )

5. Correct the following statements without changing the underlined phrases :

1. Destroying the habitat is one of the factors that contribute to species adaptation.
2. Desert is a complicated ecosystem which is not affected much by the absence of one of its species.
3. Dodo bird has large size wings.
4. Ibis bird looks like bald.

6. Write the scientific term of each of the following statements :

1. The death of all members of species of living organisms.
2. A bird is characterized by small wings and it is a non-flying bird.
3. A mammal that has a shape midway between a horse and a zebra.
4. A bird which looks like bald.
5. An aquatic plant used by pharaohs to manufacture writing paper.
6. The environmental system, that is affected severely by the absence of one species of living organisms that live in it.
7. The environmental system, that is not affected severely by the absence of one species of living organisms that live in it.
8. The path that the energy takes when it is transported from a living organism to another one inside the environmental system.
9. A group of food chains connected with each other.
10. Safe places established to protect the endangered species.
11. A protectorate in the USA is established to protect the grey bear from extinction.
12. The first protectorate that has been established in Egypt and it is characterized by rare coral reefs and coloured fish.
13. A protectorate in Egypt which contains complete whales'skeleton fossils.

7. Complete the following statements :

1. Extinction is the continuous decrease in number of .... of living organisms without .... until all the individuals of the species ....
2. .... indicate the extinction of species of living organisms.
3. .... and .... are from the causes of old extinction.

4. .... , ... and .... are among the causes of recent extinction.

5. From the extinct animals in the old ages are .... and ....

6. .... is from recently extinct birds, while .... is from recently extinct mammals.

7. Quagga is considered the midway between .... and ....

8. .... and .... are endangered birds, while .... and .... are endangered mammals.

9. .... is an example of endangered plants in Egypt, which is used by pharaohs in manufacturing of ....

10. Each living organism has a role in transferring .... in the path of the .... chain.

11. .... is an example of the simple ecosystem, while .... is an example of the complicated ecosystem.

12. .... and .... are among the ways that protect living organisms from extinction.

13. .... is considered among the safe places that has endangered species.

14. .... and .... are considered the important world's protectorates.

15. .... is the most important protectorate in the USA, which was established to protect ....

16. .... is the first established protectorate in Egypt.

17. .... is the place which contains whales'skeleton fossils.

8. Give reasons for :

1. • Occurrence of macro extinctions for many living organisms.
   • Extinction of dinosaurs.
2. Occurrence of recent extinction.
3. Dodo bird was an easy target for hunters.
4. Naming the bald eagle by this name.
5. The simple ecosystem is significantly affected by the absence of one of its species.
6. Desert ecosystem is significantly affected by the absence of one of its species.
7. Tropical forest is a complicated ecosystem.
8. It is important to reproduce the endangered species and send them back to their native habitats.
9. Scientists attempt to establish a gene bank for some types of living organisms.

10. Some governments are interested in establishing natural protectorate areas.
11. Yellowstone is an important natural protectorate.
12. World organizations are interested in studying the environment of Ras Mohamed protectorate.
13. Wadi El-Hetan is considered the most important area in Wadi El-Raiyan protectorate.

9. What is meant by ...?

1. Extinction.
2. Food chain.
3. Food web.
4. Simple ecosystem.
5. Complicated ecosystem.
6. Natural protectorates.

10. Mention one example of :

1. Extinct bird.
2. Endangered bird.
3. Endangered plant.
4. A simple ecosystem.
5. A complicated ecosystem.
6. A natural protectorate.

11. Mention the causes of each of the following :

1. The extinction in old ages [macro extinction].
2. The recent extinction.

12. Name the organism that is indicated by each of the following statements :

1. A bird with small wings.
2. A mammal that has a shape midway between a horse and a zebra.
3. An animal, whose yellowstone protectorate has been established for it.
4. A type of organisms that is being protected in Ras Mohamed protectorate.
5. An organism, whose complete fossils are found in Wadi El-Raiyan protectorate.

13. Compare between :

1. Old extinction and recent extinction [concerning : their causes].
2. Simple ecosystem and complicated ecosystem.

14. What are the consequences of each of the following ?

1. Extinction of a species from a balanced ecosystem.
2. The absence of one type of species from the simple ecosystem.

15. Exclude the unsuitable word and mention what the rest has in common :

1. Long glacial ages / A meteorite hits Earth / Destroying habitat / Volcanoes.
2. Rhinoceros / Panda bear / Quagga / Bald eagle.
3. Quagga / Dodo bird / Mammoth / Bald eagle.
4. Ras Mohamed / Yellowstone / Wadi El-Raiyan / Giza pyramids area.

16. Variant questions :

(1) **"Dinosaur is one of the famous extinct animals"**

What are the factors postulated by scientists that caused the extinction of this animal ?

(2) **Mention the most important factors that cause species extinction.**

(3) **Mention three ways to protect living organisms from extinction.**

(4) **"Ras Mohamed protectorate was established in 1983"**

a. Where is this protectorate located ?

b. Why is it considered one of the most important world's protectorates ?

(5) **"Egypt contains some protectorates for protecting the endangered animals, one of them is Wadi El-Raiyan protectorate".**

a. Where is this protectorate located ?

b. What is the name of the important area in this protectorate and what is the type of fossils which are found in this area ?

(6) **Mention what characterize each of the following :**

a. Ras Mohamed protectorate.

b. Wadi El-Hetan area.

(7) **Explain the effect of extinction of a species of living organisms on :**

a. simple ecosystem.

b. complicated ecosystem.

17. Study the following figures, then answer the questions :

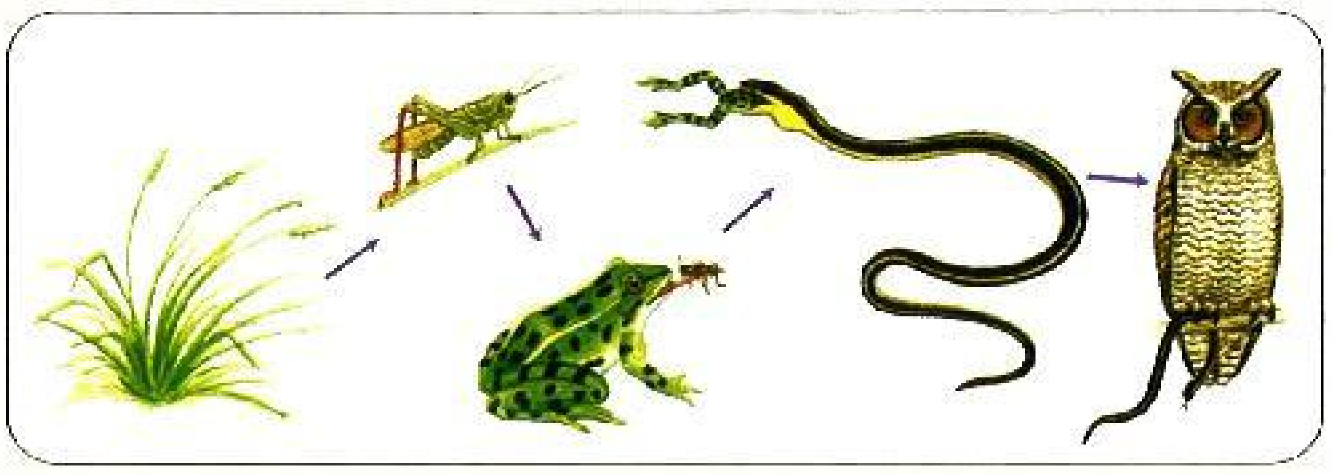
(1) **"The opposite figure represents a food chain"**

– What would happen if :

a. Green plant disappeared ?

b. Owl disappeared ?

c. Snake disappeared ?



(2) "The following figures represent two different ecosystems" :

a. Which one has multiple species ?

b. Which one is able to sustain its equilibrium and continuity of its food chain when one species disappears and why ?

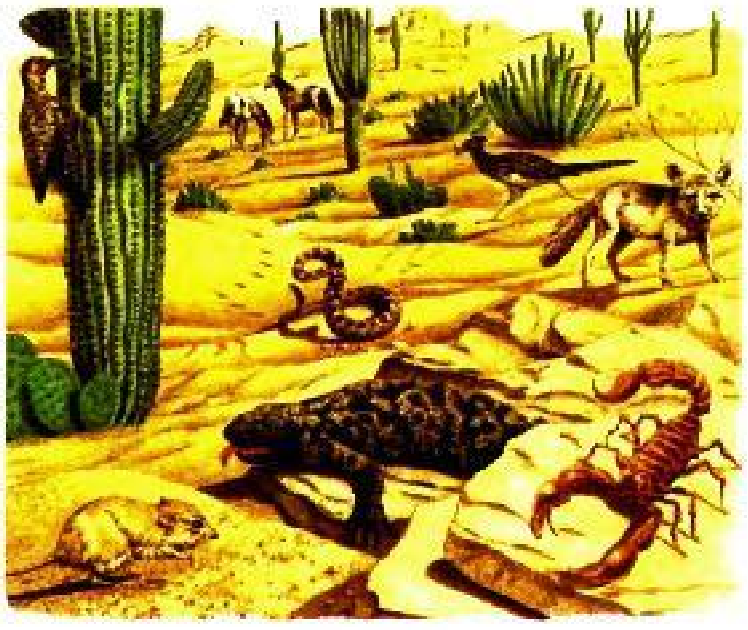


Fig. (1)

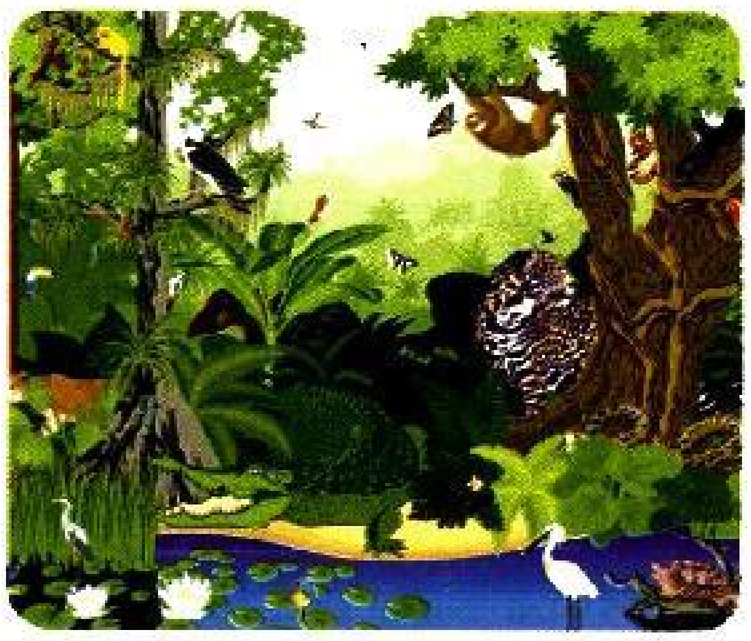


Fig. (2)

(3) From the opposite figure :

a. What is the organism which is indicated by this figure ?

b. Is it extinct or endangered animal ? (Give reasons).



(4) Look at the pictures of these land animals. Mention the name of each one and classify it as extinct or endangered.



(1)



(2)



(3)

(5) From the opposite figure :

a. What is the organism which is indicated by this figure ?

b. How it indicates the idea of extinction and evolution ?



Thinking Skills Questions

1. Choose the correct answer :

1. The following sequence shows five living organisms in a food chain :

   A ⟶ B ⟶ C ⟶ D ⟶ E

   Which answer indicates consumer organisms ? ....

   a. A , B and C b. A , D and E c. A , C and E d. B , C and D

2. A species of birds is observed on the bodies of buffaloes to catch insects that feed on the blood of buffaloes.

   At the same time buffaloes feed on grass, what is the food chain that indicates the previous food relationships ? ....

   a. Grass ⟶ buffaloes ⟶ birds ⟶ insects.

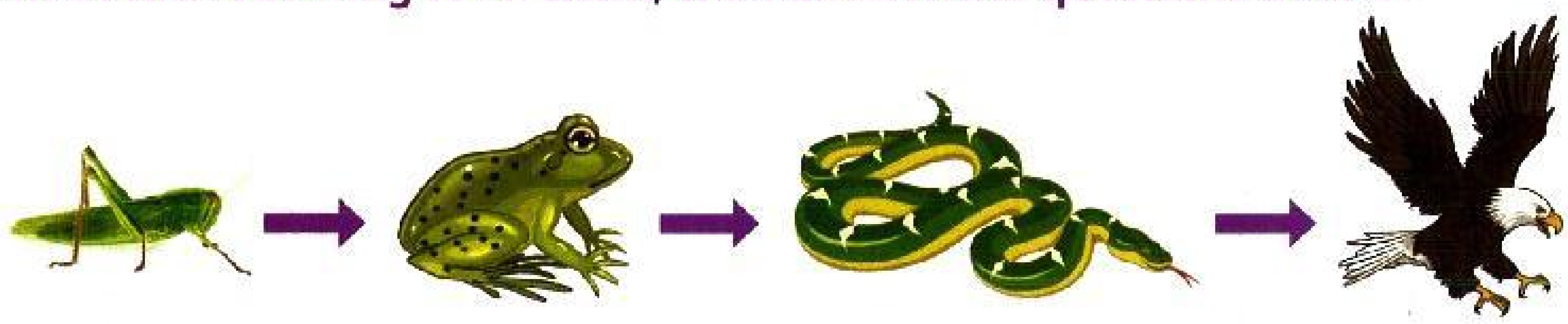
   b. Grass ⟶ buffaloes ⟶ insects ⟶ birds.

   c. Birds ⟶ insects ⟶ buffaloes ⟶ grass.

   d. Insects ⟶ birds ⟶ buffaloes ⟶ grass.

2. Do you expect that dodo bird lived on land or on tree ? Why ?

3. Look at the following food chain, then answer the questions below :



a. Which living organism is absent from the previous food chain ?

b. What is the effect of your answer on the ecosystem of this chain and for the number of frogs ?

4. In the opposite figure :



(1) If we cut the trees of the forest, what will happen to ... ?

a. Living organisms inhabit the forest.

b. The quantities of O_2 and CO_2 in the surrounding air.

(2) What are the human activities that cause the destruction of forests ?

Glossary

Unit 1

Lesson 1

Attempts	محاولات
Relationship	علاقة
Periodic table	جدول دورى
Atomic weight	الوزن الذرى
Vertical columns	أعمدة رأسية
Groups	مجموعات
Horizontal rows	صفوف أفقية
Periods	دورات
Subgroups	مجموعات فرعية
Ascending order	ترتيب تصاعدى
Periodically	دورية
Gaps	فراغات
Isotops	نظائر
X-rays	الأشعة السينية
Atomic number	العدد الذرى
Preceding	يسبق
Inert gases	غازات خاملة
Specified	خصص
Heaviest	الأثقل
Sublevels	مدارات فرعية
Artificially	صناعيًا
Blocks	فئات
Transition elements	عناصر انتقالية
Electronic configuration	التوزيع الإلكترونى

Lesson 2

Graduation	تدرج
Atomic size	الحجم الذرى
Attraction force	قوة الجذب
Electronegativity	السالبية الكهربية
Covalent	تساهمى
Polar compounds	مركبات قطبية
Metals	فلزات
Nonmetals	لافلزات
Metalloids	أشباه فلزات
Positive ion	أيون موجب
Metallic	فلزى
Nonmetallic	لافلزى
Metallic property	الخاصية الفلزية
Nonmetallic property	الخاصية اللافلزية
Dilute	مخفف
Bubbles	فقاعات
Litmus solution	محلول عباد الشمس
Basic oxides	أكاسيد قاعدية
Alkaline solutions	محاليل قلوية
Alkalis	قلويات
Chemical activity series	متسلسلة النشاط الكيميائى
Pop sound	صوت فرقعة
Instantly	لحظيًا
Coal	فحم
Burning spoon	معلقة احتراق
Acidic oxides	أكاسيد حامضية
Acids	أحماض
Amphoteric oxides	أكاسيد مترددة

Lesson 3

Alkali metals	فلزات الأقلاء
Monovalent	احادى التكافؤ
Valency	تكافؤ
Wrap	لف
Filter paper	ورقة ترشيح
Paraffin oil	زيت البرافين
Halogens	هالوجينات
Volatile	متطاير
Diatomic	ثنائية الذرة
Nuclear reactor	مفاعل نووى
Radioactive	مشع
Radiates (emits)	يشع
Gamma rays	أشعة جاما
Slides	شرائح
Liquefied nitrogen	نيتروجين مسال
Cornea of eye	قرنية العين

Lesson 4

Agricultural fields	مجالات زراعية
Industrial fields	مجالات صناعية
Personal fields	مجالات شخصية
Single covalent bond	رابطة تساهمية احادية
Hydrogen bond	رابطة هيدروجينية
Polar solvent	مذيب قطبى
Aquatic creatures	أحياء مائية
Neutral	متعادل
Electrolysis	تحليل كهربى
Negative pole	القطب السالب
Positive pole	القطب الموجب
Glowing splint	شظية مشتعلة
Acidified water	ماء محمض
Hofmann's voltameter	ڤولتامتر هوفمان

Pollution تلوث
Natural pollutants ملوثات طبيعية
Artificial pollutants ملوثات صناعية
Volcanic eruptions انفجارات بركانية
Lightning برق
Thunder storms عواصف رعدية
Insecticides مبيدات حشرية
Biological pollution تلوث بيولوچى
Hepatitis التهاب كبدى وبائى
Bilharzia بلهارسيا
Chemical pollution تلوث كيميائى
Discharging تصريف
Sewage مياة مجارى
Concentration تركيز
Blindness عمى
Infection rate معدل الاصابة
Liver cancer سرطان الكبد
Thermal pollution تلوث حرارى
Radiant pollution تلوث اشعاعى
Dumping إلقاء
Leakage تسرب
Developing تطوير
Water purification stations محطات تنقية المياه
Disinfection تعقيم

Unit 2

Lesson 1

Atmospheric layers طبقات الغلاف الجوى
Atmospheric pressure الضغط الجوى
Gaseous envelope غلاف غزى
Atmospheric air الهواء الجوى
Atmospheric envelope الغلاف الجوى
Normal atmospheric pressure الضغط الجوى المعتاد
Height above sea level الارتفاع عن سطح البحر
Elevation (altitude) ارتفاع
Length of air column طول عمود الهواء
Mass of atmospheric air كتلة الهواء الجوى
Density كثافة
Instruments أجهزة
Day weather طقس اليوم
Aeroplanes الطائرات
Atmospheric pressure maps خرائط الضغط الجوى
Curved lines خطوط منحنية
Low atmospheric pressure areas مناطق الضغط الجوى المنخفض
High atmospheric pressure areas مناطق الضغط الجوى المرتفع
Atmospheric turbulences اضطرابات فى الغلاف الجوى
Characteristics مميزات
Thickness سمك
Atmospheric phenomenon ظاهرة جوية
Organize ينظم
Vertical رأسى
Horizontal أفقى
Air currents تيارات الهواء
Gradually تدريجية
Absorption امتصاص
Ultraviolet rays الأشعة فوق البنفسجية
Ozone layer طبقة الأوزون
Ozonic atmospheric envelope الغلاف الجوى الأوزونى
Convenient ملائم / مناسب
Meteors شهب
Luminous مضئ
Vacuumed (highly rarefied) مخلخل أو مفرغ
Friction احتكاك
Limited quantities كميات محدودة
Thermal layer طبقة حرارية
Wireless communications اتصالات لاسلكية
Broadcasting البث الاذاعى
Radio waves أمواج الراديو
Radio stations محطات الاذاعة
Communication centres مراكز الاتصالات
Charged ions أيونات مشحونة
Magnetic belts أحزمة مغناطيسية
Van-Allen belts حزامى فان آلين
Cosmic radiations الأشعة الكونية
Aurora phenomenon ظاهرة الشفق القطبى
Brightly coloured light curtains ستائر خفيفة لامعة اللون
Outer space الفضاء الخرجى
Satellites أقمار صناعية

Lesson 2

Erosion of ozone layer تآكل طبقة الأوزون
Global warming phenomenon ظاهرة الأحترار العالمى
Greenhouse effect ظاهرة الاحتباس الحرارى (أثر الصوبة الزجاجية)
Postulate يفترض
Standard temperature and normal pressure معدل الضغط ودرجة الحرارة

Dobson units	وحدات دوبسون
Degree of ozone layer	درجة طبقة الأوزون
Near ultraviolet rays	الأشعة الفوق بنفسجية القريبة
Medium ultraviolet rays	الأشعة الفوق بنفسجية المتوسطة
Far ultraviolet rays	الأشعة الفوق بنفسجية البعيدة
Penetrate	يخترق
Protective shield	غلاف حماية
Chemical effect	تأثير كيميائي
Ozone hole	ثقب الأوزون
Pollutants	ملوثات
Chlorofluorocarbon compounds	مركبات الكلوروفلوروكربون
Commercially	تجاريًا
Cooling substance	مادة مبردة
Air conditioning sets	أجهزة تكييف الهواء
Propellant substance	مادة دافعة
Flating substance	مادة نافخة
Foam backing	دعامة من الفوم
Solvent substance	مادة مذيبة
Electric circuits boards	لوحات دوائر كهربية
Agricultural crops	محاصيل زراعية
Fire extinguishers	طفايات الحريق
Ultrasound airplanes (concorde)	طائرات تفوق سرعتها سرعة الصوت
Intergovernmental Panel on Climate Changes	الهيئة العالمية للتغيرات المناخية
United nations	الأمم المتحدة
Concentration	تركيز
Cutting trees	قطع الأشجار
Forests fires	حرائق الغابات
Greenhouse gases	الغازات الدفيئة
Interpretation	ترجمة/تفسير
Permit	يسمح
Absorb	يمتص
Infrared radiations	الأشعة تحت الحمراء
Negative effects	آثار سلبية
Melting of polar ice	انصهار جليد القطبين
Threats	تهديدات
Coastal areas	مناطق ساحلية
Polar bear	الدب القطبي
Seal	فيل البحر
Melting of snow masses	انصهار كتل جليدية
Floods	فيضانات
Drought waves	أمواج الجفاف

Unit 3

Lesson 1

Fossils	حفريات
Traces	آثار
Remains	بقايا
Old living organisms	كائنات حية قديمة
Preserve	يحفظ
Sedimentary rocks	صخور رسوبية
Worms' tunnels	أنفاق ديدان
Dinosaur's foot print	أثر قدم ديناصور
Shark's teeth	أسنان قرش
Dinosaur's skull	جمجمة ديناصور
Fossil of complete body	حفرية كائن كامل
Mold	قالب
Cast	طابع
Petrified fossils	حفريات متحجرة
Petrified woods	أخشاب متحجرة
Amber	كهرمان
Old geologic ages	عصور جيولوجية قديمة
Resinous matter	مادة صمغية
Decomposition	تحلل
Solid mold	قالب مصمت
Plaster of paris	جبس
Replica	نسخة طبق الأصل
Soft parts	أجزاء رخوة
Sediments	رواسب
Clay	صلصال
Plane surface	سطح مستوى
Cast of ferns	طابع من السرخسيات
Fish cast	طابع سمكة
Minerals	أملاح معدنية
Dinosaur's eggs	بيض ديناصور
Environmental conditions	ظروف بيئية
Petrification	التحجر
Petrified forests	غابات متحجرة
Organic matter	مادة عضوية
Hard skeleton	هيكل صلب
Importance	أهمية
Age determination of sedimentary rocks	تحديد عمر الصخور الرسوبية
Figuring out the paleoenvironment	الاستدلال على البيئات القديمة
Studying life evolution	دراسة تطور الحياة
Petroleum exploration	التنقيب عن البترول

Index fossils	حفريات مرشدة
Wide geographic distribution	مدى جغرافى واسع
Ferns fossils	حفريات السرخسيات
Coral fossils	حفريات المرجان
Limestone rocks	صخور الأحجار الجيرية
Fossil record	سجل حفرى
Extinction	انقراض
Appear	يظهر
Algae	طحالب
Mosses	حزازيات
Gymnosperms	عاريات البذور
Angiosperms	كاسيات البذور
Invertebrates	اللافقاريات
Mollusks with shells	رخويات ذات أصداف
Vertebrates	فقاريات
Amphibians	برمائيات
Reptiles	زواحف
Birds	طيور
Mammals	ثدييات
Exploratory wells	آبار استكشافية
Microfossils	حفريات دقيقة

Lesson 2

Extinction	انقراض
Continuous decrease	تناقص مستمر
Dying out	فناء
Compensation	تعويض
Species	أنواع
Macro extinctions	انقراضات كبرى
Recent extinction	انقراض حديث
Meteorites	النيازك
Long glacial ages	عصور جليدية طويلة
Poisonous gases	غازات سامة
Volcanoes	براكين
Interference of man	تدخل الإنسان
Destroying natural habitat	تدمير الموطن الطبيعي
Overhunting	الصيد الجائر
Environmental pollution	تلوث بيئى
Climatic changes	تغيرات مناخية
Natural disasters	كوارث طبيعية
Ecosystem	النظام البيئى
Extinct species	أنواع منقرضة
Endangered species	أنواع مهددة بالانقراض
Protect	يحمى
Panda bear	دب الباندا
Rhinoceros	الخرتيت
Bald eagle	النسر الأصلع
Ibis bird	طائر أبو منجل
Papyrus plant	نبات البردى
Barbary sheep	كبش أروى
Ecological equilibrium	توازن بيئى
Food chain	سلسلة غذائية
Food web	شبكة غذائية
Simple ecosystem	نظام بيئى بسيط
Complicated ecosystem	نظام بيئى مركب
Desert ecosystem	نظام بيئى صحراوى
Tropical forest ecosystem	نظام بيئة غابة استوائية
Members	أنواع
Awareness	وعى
Natural protectorates	محميات طبيعية
Safe areas	أماكن آمنة
Yellowstone protectorate	محمية يلوستون
Ras Mohamed protectorate	محمية رأس محمد
Coral reefs	شعاب مرجانية
Whales' skeletons	هيكل عظمية للحيتان

FIRST TERM

SCIENCE

NOTEBOOK

BY A GROUP OF SUPERVISORS



- Worksheets
- Final Revision
- Final Examinations

EL-MOASSER SERIES

2nd Prep. 2025

Contents

Part 1 Worksheets.

Part 2 Final Revision.

Part 3 Final Examinations.

PART 1

Worksheets



UNIT 1 Periodicity of Elements and their Properties.

UNIT 2 The Atmosphere and Protecting the Planet Earth.

UNIT 3 Fossils and Protecting Species from Extinction.

UNIT 1

Lesson One

Attempts of Elements Classification

Worksheet 1

1. A. Choose the correct answer :

1. Mendeleev arranged the elements of similar properties in ....
   a. vertical periods. b. horizontal groups.
   c. vertical groups. d. horizontal periods.
2. Moseley classified elements in his table in an ascending order according to their ....
   a. atomic weights. b. atomic numbers.
   c. chemical activity. d. valencies.
3. The number of elements in Mendeleev's periodic table is .... elements.
   a. 67 b. 76 c. 92 d. 116
4. .... left gaps in his table to be filled with suitable discovered elements in future.
   a. Moseley b. Rutherford c. Bohr d. Mendeleev
5. The scientist .... added the zero group to Mendeleev's periodic table.
   a. Mendeleev b. Rutherford c. Moseley d. Bohr
6. The scientist .... discovered the main energy levels. *(El-Dakahlia 2020)*
   a. Moseley b. Bohr c. Hofmann d. Mendeleev

B. Write the scientific term :

1. A table in which the elements are arranged in an ascending order according to their atomic weights. *(Futures Sch. / Cairo 2020)* (..........................)
2. A table in which the elements are arranged in an ascending order according to their atomic numbers. *(El-Sharkia 2020)* (..........................)
3. They are symbolized by K , L , M , N , O , P and Q letters. (..........................)

2. A. Complete the following statements :

1. Mendeleev discovered that the properties of elements were repeated .... by the beginning of each new ....
2. The atomic number of each element in Moseley's periodic table increases by .... from the preceding element in the same ....
3. Moseley specified a place below the table for .... and .... elements. *(Leaders Lang. Sch. / Cairo 2022)*

4. Mendeleev arranged the elements ascendingly according to .... , while Moseley arranged them ascendingly according to .... *(Al Bayan Lang. Sch. / Cairo 2023)*
5. Mendeleev explained his periodic table in his book ....

B. What are the disadvantages of Mendeleev's table ? (Mention two only).

....

....

3. A. To who are these achievements attributed :

1. Corrected the atomic weights of some elements which were estimated wrongly. (........................)
2. Added zero group to the periodic table. (........................)
3. Discovered that the nucleus of the atom contains positively charged protons. *(St. Joseph Sch. / Cairo 2020)* (........................)

B. Put (✓) or (✗), then correct what is wrong :

1. The elements which have similar chemical properties are put in horizontal periods. *(Essmat Sch. / Cairo 2020)*
   (   ) ....
2. Scientists classified the elements in order to facilitate their study.
   (   ) ....
3. Mendeleev had to put more than one element in one cell, as iron, cobalt and nikel.
   (   ) ....
4. Rutherford discovered the main energy levels of the atom.
   (   ) ....

4. A. Give a reason for :

Many attempts are made by scientists for classification of elements.

....

....

B. Correct the underlined words :

1. The elements are arranged in <u>**Mendeleev's table**</u> in an ascending order according to their atomic numbers and the way of filling their energy sublevels with electrons. (........................)
2. The number of energy levels in the heaviest known atoms is <u>**9**</u> levels. (........................)
3. The number of known elements in the modern periodic table till now is <u>**92**</u> elements. *(Manaret Sch. / Cairo 2020)* (........................)

Worksheet 2

1. A. Complete the following statements :

1. The number of elements which exist in nature is ....
2. Elements of s-block are located on the .... of the periodic table and they arranged in .... groups.
3. The period number of the element equals the number of .... occupied by electrons in its atom.
4. The transition elements start from period .... in the modern periodic table.
5. The modern periodic table consists of .... horizontal periods and .... vertical groups. *(Science Inspectorate / Dakahlia 2023)*

B. What is the scientific principle upon which the elements are arranged in the modern periodic table ?

....

....

2. A. Write the scientific term :

1. • A block of elements which is located on the right side of the periodic table.
   • The block which contains the groups from (3A) to (0). (........................)
2. A kind of elements that are located in d-block. (........................)
3. It indicates the number of electrons that revolve in energy levels. (........................)
4. The block which contains the lanthanides and actinides. *(St. Joseph Sch. / Cairo 2020)* (........................)

B. Locate the position of the following elements in the modern periodic table :

1. $_{11}Na$: .... *(Degla Valley Sch. / Cairo 2020)*
2. $_{18}Ar$: .... *(Degla Valley Sch. / Cairo 2020)*
3. $_{20}Ca$: .... *(Akhnaton Sch. / Cairo 2020)*
4. $_{9}F$: ....

C. From the following table :

	Groups							
	1A	2A	3A	4A	5A	6A	7A	0
Second period					Y			
Third period	X							Z

[NB. The letters in the table don't represent the actual symbols of elements]

1. Calculate the atomic number of element (X).

....

2. What is the modern number of the group of the element (Y) ?

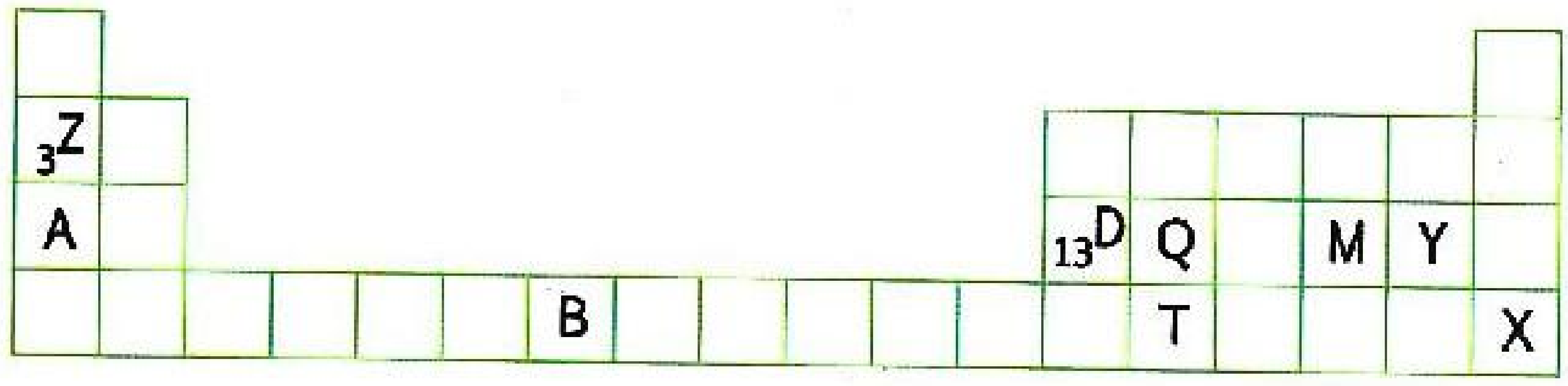
....

3. **Complete :** The outermost energy level of element (Z) contains .... electrons.

3. A. Choose the correct answer :

1. Elements of p-block are arranged in .... groups. *(Manaret Sch. / Cairo 2020)*
   a. two b. five c. six d. eight
2. Which of the following elements locates in the third period ? ....
   a. $_{19}K$ b. $_{15}P$ c. $_{6}C$ d. $_{3}Li$
3. All of the following elements are located in group (2A) except ....
   a. $_{4}Be$ b. $_{20}Ca$ c. $_{11}Na$ d. $_{12}Mg$
4. The element that its atomic number equals 17 is similar in its chemical properties to the element that its atomic number equals .... *(El-Santa Zone / El-Gharbia 2023)*
   a. 2 b. 7 c. 9 d. 19
5. The elements which have the same properties locate in the same .... in the periodic table.
   a. period b. group c. nucleus d. energy level
6. The block that contains groups (1A) and (2A) in the periodic table is .... block.
   a. s b. p c. d d. f
7. Which of the following elements locates in the same group in the periodic table ? ....
   a. $_{11}Na, _{6}C$ b. $_{11}Na, _{3}Li$ c. $_{11}Na, _{29}Cu$ d. $_{11}Na, _{10}Ne$
8. An element, its atomic number is (18) , so it is considered as ....
   a. a transition element. b. an inert gas.
   c. a metallic element. d. a halogen.

B. The following table represents a section of the modern periodic table :



[NB. The letters in the table don't represent the actual symbols of elements]

1. What is the symbol indicates each of the following :
   a. A transition element : ....
   b. An inert gas : ....
   c. An element lies in the third period and group (6A) : ....

2. What is the block of the elements (A), (B) and (D) ?

....

3. **Choose :** The atomic number of element (B) is .... the atomic number of element (T).

a. more than   b. equal to   c. less than

4. A. Find the atomic number of each of the following :

1. An element exists in period 2 and group (6A).

....

2. An element exists in period 3 and group (1A).

....

3. An element exists in period 2 and group (0).

....

B. Put (✓) or (✗), then correct what is wrong :

1. The modern periodic table consists of three blocks of elements.

( ) ....

2. The period number of the element equals the number of electrons in the outermost energy level in its atom.

( ) ....

3. The atomic number of every element increases by one electron over the element that precedes it in the same period.

( ) ....

C. Give a reason for :

Elements of the same group have similar properties. *(El-Menofia 2020)*

....

UNIT 1
Lesson Two

Graduation of Elements Properties in the Modern Periodic Table

Worksheet 3

1. Complete the following statements :

1. The ability of the atom in covalent molecule to attract the electrons of the chemical bond towards itself, is known as ....
2. A covalent polar compound that is formed of one oxygen atom and two hydrogen atoms, is known as ....
3. The smallest atomic size element is located at the .... of the periodic table, while the largest atomic size element is located at the .... of the periodic table.
4. A covalent polar compound that has lower polarity than water and has three single covalent bonds, is known as ....

2. A. Give reasons for :

1. The atomic size of sodium ($_{11}Na$) is greater than that of magnesium ($_{12}Mg$).

....

....

2. In the same group as we go from up to down, the atomic size increases by increasing the atomic number.

(Science Inspectorate / Ismailia 2022)

....

3. Ammonia (NH_3) is considered as a polar covalent compound.

....

4. Water is much more polar than ammonia. *(El-Sahel Zone / Cairo 2023)*

....

....

B. What happens when ... ?

Increasing the atomic number for elements of the third period
[related to : the atomic size].

....

3. A. Compare between :

The group and the period. (concerning the graduation of atomic size property) :

The group	The period
....	....
....	....
....	....
....	....

B. Show the graduation of the atomic size property of elements of the same period by increasing the atomic number. Draw the relationship that shows this graduation.

....

....

4. A. Write the scientific term :

1. The measuring unit of atomic size. *(Science Inspectorate / Behira 2022)* (........................)
2. They are covalent compounds in which the difference in electronegativity between their elements is relatively high. (........................)

B. Put (✓) or (✗), then correct what is wrong :

1. In the same period as we go from left to right, the atomic size decreases by increasing the atomic number.
   (   ) ....
2. Picometre = Part of million of the million part of a centimetre.
   (   ) ....

Worksheet 4

1. A. Write the scientific term :

1. Elements which have less than 4 electrons in their outermost energy level.
   (........................)
2. An atom of nonmetallic element that gains one electron or more during the chemical reaction. *(Dream Sch. / Giza 2020)* (........................)
3. The strongest nonmetal in group (7A). *(Leaders Sch. / Alexandria 2020)* (........................)

B. Correct the underlined words :

1. The number of electrons in positive ion is **greater** than that of its atom. *(Port Said 2020)* (........................)
2. Each period ends by **a nonmetal element**. *(Manaret Sch. / Cairo 2020)* (........................)
3. The metallic property **decreases** in group (1A) as we go from the top to the bottom. (........................)
4. **Lithium** is the strongest metallic element in group (1A). (........................)

2. Complete the following statements :

1. During chemical reactions, atoms of metals tend to .... electron(s) and change into .... which carry a number of positive charges equals to the number of lost .... *(Leaders Lang. Sch. / Cairo 2022)*
2. Silicon ($_{14}Si$) is a .... element which has the properties of .... and ....
3. By increasing the atomic number within the same period, the metallic property ...., while the nonmetallic property ....
4. The most metallic element in group (1A) is located at the .... of this group, while the least metallic element is located at the .... of the same group.
5. Each period in the modern periodic table starts with .... element. *(St. Joseph Sch. / Cairo 2020)*

3. A. Choose the correct answer :

1. All of the following ions have the same electronic configuration of neon ($_{10}Ne$) except ....
   a. Al^{+3} b. Na^{+} c. Li^{+} d. Mg^{+2}
2. An element (X), its atomic number is 15, so the number of electrons in its ion equals ....
   a. 10 b. 15 c. 17 d. 18
3. By increasing the atomic number within the same period, the .... *(Al Bayan Lang. Sch. / Cairo 2023)*
   a. metallic property increases.
   b. metallic property decreases.
   c. nonmetallic property decreases.
   d. atomic size increases.
4. An element (Y), its atomic number is 13, so the electronic configuration of its ion is .... *(Sherif Talat Sch. / El-Sharkia 2020)*
   a. 2 , 8 b. 2 , 8 , 3 c. 2 , 8 , 8 d. 2 , 8 , 8 , 3
5. All of the following elements are from semi-metals except ....
   a. tellurium. b. silicon. c. boron. d. bromine.

B. Give a reason for :

Cesium is considered one of the strongest metallic elements. *(St. Joseph Sch. / Cairo 2020)*

....

4. A. What is meant by ... ?

1. Nonmetals : ....

....

2. Positive ion : ....

....

3. Metalloids : .... *(Dream Sch. / Giza 2020)*

....

B. Look at the following figures, then answer the following questions :

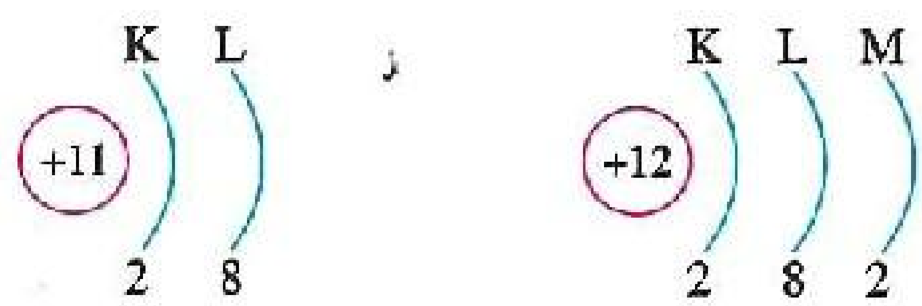


Fig. (A) Fig. (B)

1. Which of the previous figures represents :

a. A positive ion : ....

b. A neutral atom : ....

2. Determine the location of the neutral atom in the periodic table :

....

Worksheet 5

1. A. Show by symbolic balanced equations each of the following :

1. Adding dilute HCl to pieces of magnesium. *(East Alex. Directorate / Alex. 2022)*

....

2. Burning a magnesium strip in air, then adding some water.

(El-Manahel Private Lang. Sch. / Sohag 2022)

....

....

3. Burning a piece of coal in air. *(Borg El-Arab Zone. / Cairo 2020)*

....

B. How can you differentiate between copper and potassium :

	Copper	Potassium
By adding each of them to water :		....

2. A. What is meant by ... ?

1. Chemical activity series : *(Damietta 2020)*

....

....

2. Acidic oxides :

....

....

B. Choose the correct answer :

1. All of the following elements don't react with dilute HCl, except ....
   a. Cl b. Zn c. S d. C
2. All of the following are related to CO_2 gas, except .... *(Bloom Sch. / Giza 2020)*
   a. it is acidic oxide. b. it is nonmetal oxide.
   c. its solution turns litmus to red. d. its solution turns litmus to blue.
3. Metal oxides are .... oxides.
   a. acidic b. basic c. neutral d. amphoteric
4. Sodium oxide is from .... oxides. *(Al Bayan Lang. Sch. / Cairo 2023)*
   a. amphoteric b. acidic c. nonmetallic d. basic

3. A. Complete the following statements :

1. Some metal oxides dissolve in water forming .... , which turn litmus solution into .... *(Borg El-Arab Zone. / Alexandria 2020)*
2. Sodium reacts with water and .... gas evolves which .... with a .... sound.
3. Both of .... and .... are metals, which react at high temperatures only with hot water vapour.
4. When magnesium oxide dissolves in water, it gives .... , while carbon dioxide dissolves in water giving ....
5. Basic oxides are formed by the reaction of .... with oxygen, while acidic oxides are formed by the reaction of .... with oxygen.

6. $CO_2 + H_2O \longrightarrow$ ....

7. $Zn +$ .... $\xrightarrow{dil.}$ $ZnSO_4 +$ ....

B. Compare between basic oxides and acidic oxides (two points only) :

(Akhnaton Sch. / Cairo 2020)

Basic oxides	Acidic oxides
....	....
....	....
....	....

4. A. $C + O_2 \xrightarrow{\Delta} (a)$

$(a) + H_2O \longrightarrow (b)$

1. Write the name and the chemical formula of each (a) and (b).

....

2. What is the effect of (b) on litmus solution ?

....

B. What happens when ... ?

1. Putting a burning magnesium strip inside a jar filled with oxygen gas.

....

2. Adding drops of violet litmus solution to a cylinder containing a piece of burning coal.

(El Qalyoubia 2020)

....

3. Dissolving magnesium oxide in water. *(Dream Sch. / Giza 2020)*

....

Worksheet 6 on Lessons one & two Unit 1

1. **A. Choose the correct answer :**

1. Mendeleev arranged elements of similar properties in vertical columns called later as ....

   a. groups. b. periods. c. rows. d. lines.

2. .... explained his periodic table in his book "Principles of Chemistry".

   a. Moseley b. Rutherford c. Bohr d. Mendeleev

3. Helium locates in .... group.

   a. 2A b. 3A c. 4A d. zero

4. Nucleus is positively charged because it contains ....

a. electrons. b. protons. c. neutrons. d. energy levels.

5. .... react very slowly with cold water. *(Damietta 2020)*

a. Ca & Mg b. K & Na c. Zn & Fe d. Cu & Ag

B. Give reasons for :

1. Mendeleev left gaps in his periodic table. *(Akhnaton Sch. / Cairo 2020)*

....

....

2. Sulphur dioxide is considered as an acidic oxide.

....

2. A. Complete the following :

1. The scientist who discovered that the nucleus contains positively charged protons, was ....

2. In the modern periodic table, the largest atom in size is .... atom, and the smallest one is .... atom.

3. Both of .... and .... don't react with water.

B. Locate the position of the following elements in the modern periodic table :

1. $_{10}Ne$: .... *(Essmat Sch. / Alexandria 2020)*

2. $_{5}B$: ....

3. $_{14}Si$: ....

4. $_{6}C$: ....

3. A. Put (✓) or (✗), then correct what is wrong :

1. The p-block elements are located in the left side of the periodic table.

( ) ....

2. The f-block contains lanthanides and actinides.

( ) ....

3. Na_2O is an acidic oxide.

( ) ....

B. What happens when ... ?

1. Burning of carbon in oxygen.

....

2. Sodium atom loses one electron during the chemical reaction.

....

4. A. **Find the atomic number of each of the following :**

1. An element exists in period (4) and group (1A).

....

2. An element exists in period (2) and group (7A).

....

3. An element exists in period (3) and group (5A).

....

B. **Give an example for :**

1. A polar covalent compound : ....

(Official Lang. Sch. / Giza 2023)

2. A nonmetallic element : ....
3. A metalloid : ....
4. A metal reacts instantly with water : .... *(El-Gharbia 2020)*
5. A metal doesn't react with water : .... *(Dokki Zone / Giza 2023)*
6. A basic oxide : ....
7. An acidic oxide : .... *(El-Dakahlia 2020)*

UNIT 1

Lesson Three

Main Groups in the Modern Periodic Table

Worksheet 7

1. A. Write the scientific term :

1. A group of metals which react strongly with water forming alkaline solutions. (........................)
2. A substance which kept under its surface most alkali metals. (........................)

B. Choose the correct answer :

1. Elements which have atomic numbers .... are called alkali metals.

   a. 2 , 8 , 16 b. 2 , 10 , 18 c. 3 , 11 , 19 d. 4 , 12 , 20

2. Alkali metals have all the following properties, except ....

   a. they have low density. b. they conduct electricity.

   c. they conduct heat. d. they don't react with water.

3. When sodium reacts with water, ... gas evolves. *(Akhnaton Sch. / Cairo 2020)*

   a. O_2 b. CO_2 c. H_2 d. NO_2

4. Most .... are kept under the surface of kerosene in the lab.

   a. alkali metals b. halogens c. inert gases d. alkaline Earth metals

5. The most active element in group (1A) is .... *(Akhnaton Sch. / Cairo 2020)*

   a. Na b. Cs c. K d. Li

2. Give reasons for :

1. Elements of group (1A) are known as alkali metals. *(Essam Sch. / Alexandria 2020)*

   ....

2. Sodium is kept under the surface of kerosene.

   ....

3. Rubidium and cesium elements sink in water.

   ....

4. The reaction of potassium with water is stronger than that of sodium.

   ....

   ....

3. Complete the following statements :

1. Lithium element .... on water surface, as its density is .... than that of water.
2. During the chemical reactions, sodium tends to .... an electron and changes into .... ion which carries .... positive charge.
3. Potassium reacts with water giving .... and .... gas evolves.
4. The chemical activity of alkali metals increases as the .... increases.

4. The opposite figure represents group (1A) of the periodic table.

Answer the following questions :

A
B
C
D
E

[NB. The letters don't represent the actual symbols of elements]

1. The element which has the electronic configuration (2, 8, 8, 1) is ....
2. The most metallic element is ....
3. Elements which float on the water surface are ....
4. The least metallic element is ....

Worksheet 8

1. A. Complete the following :

1. Halogens locate in group .... *(Al Bayan Lang. Sch. / Cairo 2023)*
2. Halogens which exist in gaseous state includes .... , ... *(Leaders Sch. Alexandria 2020)*
3. We use .... to preserve food as it emits gamma rays.
4. Silicon is used in manufacture of ...., while liquefied nitrogen is used in ....

B. Write the scientific term :

1. The halogen which exists in a liquid state. *(El-Menofia 2020)* (........................)
2. Rays which are emitted from radioactive cobalt 60. (........................)

2. A. Which of the following elements ($_{11}X$) , ($_{17}Y$) and ($_{14}Z$) :

1. Can replace iodine in potassium iodide solution : ....
2. Used in the manufacture of electronic slides : ....
3. Can react together and form salt : ....

B. Mention one use for each of the following :

1. Liquid sodium : .... *(Aswan 2020)*

2. The radioactive cobalt 60 : .... *(Essmat Sch. / Alexandria 2020)*

3. A. Put (✓) or (✗), then correct what is wrong :

1. Halogens are monovalent elements.

   (   ) ....

2. Boiling point of liquefied nitrogen is (–196°C).

   (   ) ....

3. Bromine is a halogen which exists in a solid state.

   (   ) ....

B. Give reasons for :

1. Halogens are not exist in nature in elementary state.

   ....

2. Halogens are called by this name. *(Qena 2020)*

   ....

3. Liquefied nitrogen is used in cornea preservation. *(Science Inspectorate / El-Sharkia 2023)*

   ....

4. A. Complete the following equations :

1. $Br_2 + NaCl \longrightarrow$ ....
2. $Cl_2 + 2KI \longrightarrow$ .... + ...
3. $2K + Br_2 \longrightarrow$ ....

B. Choose the odd word out, then mention the scientific term for the rest :

1. Potassium / Iodine / Fluorine / Astatine / Bromine.

2. Fluorine / Chlorine / Oxygen / Hydrogen / Sodium.

   ....

   ....

Worksheet 9 on Lessons One, Two & Three Unit 1

1. A. Complete the following statements :

1. .... is a radioactive element.
2. Halogens mean ....
3. Both of .... and .... are examples of acidic oxides.
4. Elements of the same .... are similar in the number of electrons in the outermost energy level.

B. Write the scientific term of each of the following :

1. The metalliod which is used in the manufacture of electronic devices.
(Borg El-Arab Zone. / Alexandria 2020) (........................)
2. The halogen which exists in a solid state.
(Borg El-Arab Zone. / Alexandria 2020) (........................)

2. A. Correct the underlined words :

1. Liquefied nitrogen is used in **food preservation**. (........................)
2. Halogens exist in the form of **monoatomic** molecules. (........................)
3. Transition elements lie in **s-block**. *(El-Menofia 2020)* (........................)

B. Give reasons for :

1. Potassium is more active than sodium. *(Manaret Sch. / Cairo 2020)*
....
....
2. Iodine can't replace bromine in its salt solution.
....
....

3. A. Choose the odd word (or symbol) out :

1. SO_2 / MgO / Na_2O / CaO
....
2. Fluorine / Chlorine / Iodine. *(West Fayoum Zone / Fayoum 2023)*
....
3. Sodium / Magnesium / Aluminium / Sulphur.
....

B. What happens when ... ?

1. Increasing the atomic number in period 1 (Concerning the atomic size).

....

2. Putting a piece of potassium in a beaker containing paraffin oil.

....

4. A. Choose the correct answer :

1. .... is used in food preservation.

a. Sodium　b. Cobalt 60　c. Silicon　d. Liquefied nitrogen

2. Carbon dioxide reacts with water forming ....

a. H_2CO_3　b. HCl　c. HNO_3　d. H_2SO_4

3. Al_2O_3 is known as ....

a. acidic oxide.　b. basic oxide.

c. amphoteric oxide.　d. alkaline oxide.

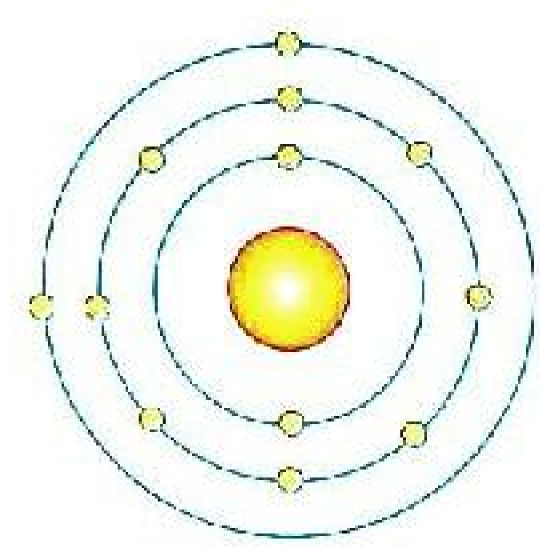
4. The electronic configuration of the ion of potassium ($_{19}K$) element is similar to the electronic configuration of the atom of .... element.

a. $_{11}Na$　b. $_{10}Ne$　c. $_{18}Ar$　d. $_{15}P$

5. The electronic configuration of neon atom ($_{10}Ne$) is similar to that of the ions of all the following atoms, except ....

a. $_9F$　b. $_8O$　c. $_7N$　d. $_{16}S$

B. The opposite figure represents the electronic configuration of element (X) that presents in the modern periodic table :



1. Determine :

a. The location of the element : ....

b. The block to which this element belongs to : ....

2. Conclude the atomic number of :

a. element (Y) that follows it in the same period :

....

....

b. element (Z) that follows it in the same group :

....

....

UNIT 1

Lesson Four

Water

Worksheet 10

1. A. Choose the correct answer :

1. All of the following are from water properties except ....
   a. it exists in three states.
   b. it has high boiling point.
   c. its density decreases on freezing.
   d. it is a non-polar compound.

2. Water molecule consists of ....
   a. two atoms of three different elements.
   b. three atoms of two different elements.
   c. three atoms of three different elements.
   d. four atoms of two different elements.

B. What is the importance of Hofmann's voltameter ? *(South Sinai 2020)*

....

2. A. Complete the following statements :

1. Water is considered as a good .... solvent, as it dissolves most ....compounds.
2. The density of water in .... state is lower than its density in .... state.
3. Water molecule consists of .... atoms and .... atom.
4. The bond between water molecules is called .... bond. *(Akhnaton Sch. / Cairo 2020)*
5. Increasing the boiling point of water is due to the presence of ....

B. What is meant by hydrogen bond ?

....

....

3. A. What happens when ... ?

The temperature of water decreases below 4°C.

....

....

B. Put (✓) or (✗), then correct what is wrong :

1. Table salt and sugar are from covalent compounds.
   (   ) ....

2. The angle between the two single covalent bonds in water molecule is 104.5°
   ( ) ....
3. Hydrogen bond is weaker than covalent bond.
   ( ) ....

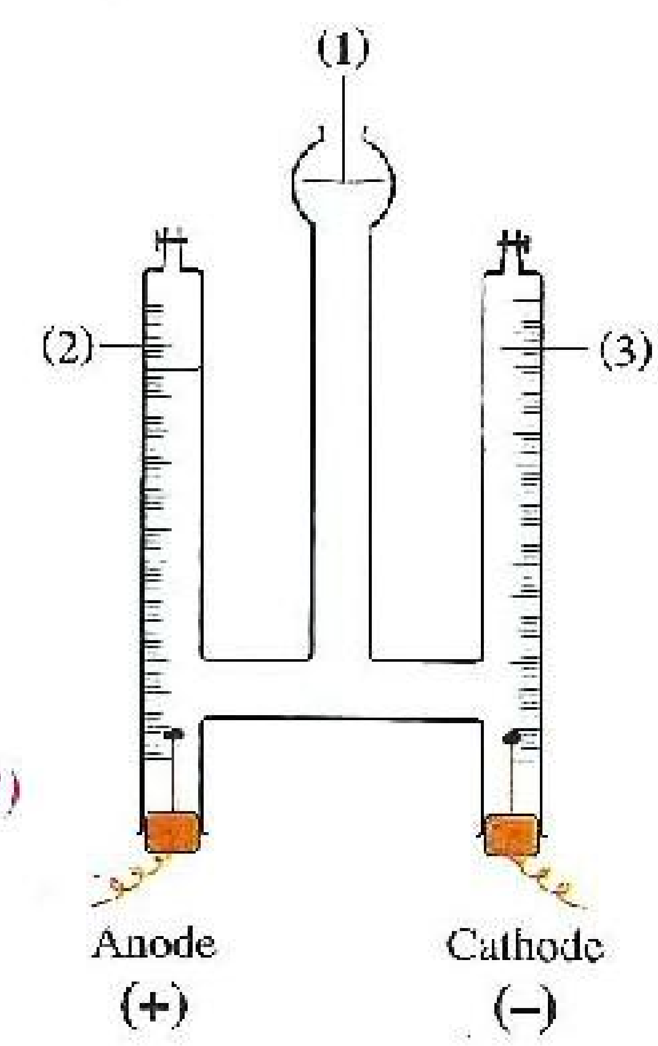
4. A. Write the scientific term :

1. The bond between hydrogen atom and oxygen atom in water molecule.
   (El-Gharbia 2020) (.........................)
2. The type of bond which links the molecules of water together.
   (Leaders Sch. / Alexandria 2020) (.........................)
3. The positive pole of Hofmann's voltameter. (.........................)

B. Give reasons for :

1. Ice floats on water surface.
   ....
2. Adding drops of dilute acid to water during its electrolysis.
   ....
3. The closed glass bottle filled with water is broken when it is put in freezer.
   ....
4. Sugar dissolves in water although it is a non-polar compound. *(Essmat Sch. / Alexandria 2020)*
   ....
5. Pure water doesn't effect on both of litmus paper.
   ....

C. From the opposite figure , answer the following questions : *(Lycee El-Haram Sch. / Giza 2020)*



1. What is the name of this apparatus?
   ....
2. Label the numbers (1) , (2) and (3).
   (1) .... (2) .... (3) ....
3. What happens if a glowing splint is put above the anode and the cathode?
   * Above the anode, ...
   * Above the cathode, ...
4. Write the balanced equation of this process.
   (Science Inspectorate / Qena 2023)
   ....
5. Calculate the volume of the gas that evolves at the anode, if the volume of the gas that evolves at the cathode is 20 cm^3 *(Heliopolis Modern Lang. Sch. / Cairo 2022)*
   ....

Worksheet 11

1. Explain what happens when ... ?

1. Storing the tap water in empty plastic bottles.

....

....

2. Water is mixid with the wastes of man and animal. *(Borg El-Arab Zone. / Alexandria 2020)*

....

....

2. Complete the following :

1. Mixing of animals and human wastes with water leading to the infection with many diseases such as .... , ... and ....
2. Increasing the mercury concentration in drinking water causes .... , while increasing arsenic concentration in it, increases the infection rate of ....
3. We must .... the drinking water tanks and don't store the tap water in .... bottles.
4. Eating fish contain high concentration of lead causes the ....

   (Amoun Lang. Sch. / Cairo 2023)
5. The nuclear reactors cause both .... and .... pollution for water. *(El-Menofia 2020)*

3. A. 1. Nuclear reactors cause thermal water pollution and radiant water pollution. Explain.

....

....

....

....

2. How to protect water from pollution ? (Two points only).

....

....

B. Write the scientific term :

1. A kind of water pollution which results from mixing of humans and animals wastes with water. *(Badr Lang. Sch. / Cairo 2023)* (........................)
2. A kind of water pollution which results from discharging factories wastes and sewage in rivers and seas. (........................)
3. A water pollutant which causes the death of brain cells.

   (El-Menofia 2020) (........................)

4. **A. What is meant by water pollution ?** *(Port Said 2020)*

....

....

B. Put (✓) or (✗), then correct what is wrong :

1. Volcanic eruptions and lightning accompanied by thunder storms are from artificial environmental pollutants.

   (   ) ....

2. Adding of chemical fertilizers to water causes water pollution.

   (   ) ....

3. Storing the tap water in plastic bottles causes the increase of infection with hepatitis.

   (   ) ....

General Exercise of the School Book on Unit One

1. Choose :

1. Scientist .... discovered the main energy levels in the atom.

   a. Bohr   b. Mendeleev   c. Moseley   d. Hofmann

2. Sodium oxide is from .... oxides.

   a. amphoteric   b. acidic   c. nonmetallic   d. basic

3. All of the following elements are from semi-metals except ....

   a. tellurium.   b. silicon.   c. boron.   d. bromine.

4. The strongest metal lies in the .... group.

   a. 2A   b. 1A   c. 1B   d. 7A

2. What is meant by ... ?

1. Chemical activity series :

   ....

2. Water pollution :

   ....

3. Semi-metals :

   ....

3. How can you differentiate between magnesium oxide and sulphur oxide ?

....

....

4. What is the importance of ... ?

1. Liquefied nitrogen : ....

2. Sodium in liquid state : ....

3. Water : ....

5. Give reasons for :

1. The use of radioactive cobalt 60 in food preservation.

....

2. Elements of the same group have similar properties.

....

3. The boiling point of water is high.

....

4. Alkali metals are kept under kerosene in the lab.

....

6. What is the effect of the following on the water environment ?

1. Drainage of factories wastes in rivers and seas.

....

2. Using of rivers and seas water as a renewable source for cooling the nuclear reactor.

....

3. Mixing of animal and man wastes with water.

....

Model Exams on Unit 1

Model Exam 1

56

Answer the following questions :

Question 1 — 14 marks

A Choose the correct answer :

1. Pure water at the normal atmospheric pressure boils at ....°C

   a. 50 b. 90 c. 100 d. 10

2. Polar water molecules are linked together by .... bonds.

   a. hydrogen b. covalent c. ionic d. no correct answer

3. Element .... has the properties of both metals and nonmetals.

   (Ashmoon Zone / El-Menofia 2020)

   a. Na b. Cl c. B d. Ne

4. The number of elements in Mendeleev's periodic table is .... elements.

   a. 92 b. 118 c. 76 d. 67

B The opposite table represents a section of the modern periodic table on which the atomic sizes of some elements are recorded :

N	O	F
....	66	....
P	S	Cl
....	104	99

1. Complete the spaces in the table with the following numbers :
   (110 / 70 / 64)

2. **Choose :**
   The difference between the size of phosphorus atom and fluorine atom = 46 ....
   (Nanometre - Micrometre - Picometre - Angestrom). *(Manaret Sch. / Cairo 2020)*

C Mention the atomic number of an element (X) that locates in group zero and period three. *(El-Tur Zone / South Sinai 2020)*

....

Question 2 — 14 marks

A Correct the underlined words :

1. Pure water is a **good** conductor of electricity. (........................)
2. The **cathode** is the positive pole in Hofmann's voltameter. (........................)
3. **Moseley** discovered that the nucleus of the atom contains positively charged protons. *(Borg El-Arab Sch. / Alex. 2020)* (........................)
4. **Liquefied nitrogen** is used in food preservation. (........................)

B Write the scientific term :

1. The descending arrangement of elements according to their chemical activity.
(Amoun Lang. Sch. / Cairo 2023) (..........................)
2. A type of weak electrostatic attraction arises between the molecules of some polar compounds. *(Manaret Sch. / Cairo 2020)* (..........................)
3. The block that contains the series of lanthanides and actinides.
(St. Joseph Sch. / Cairo 2020) (..........................)
4. A good polar solvent for most of ionic compounds.
(St. Joseph Sch. / Cairo 2020) (..........................)

C Give a reason for :

The volume of water increases on decreasing its temperature than 4°C.

....

....

Question 3 *14 marks*

A Complete the following sentences :

1. Liquid .... is used in the transferring .... from inside the nuclear reactor to outside.
2. Acidic oxides dissolve in water forming .... while basic oxides forming ....
3. Nuclear reactors cause both of .... water pollution and .... water pollution.
4. Both of .... and .... are examples of nonmetals.

B Choose from column (B) what suits it in column (A) : *(Manaret Sch. / Cairo 2020)*

(A)	(B)
1. Liquid sodium	a. is used in preservation of food.
2. Liquefied nitrogen	b. is used in manufacture of electronic devices.
3. Cobalt 60	c. is used in nuclear reactors.
4. Silicon slides	d. is used in preservation of cornea of the eye.
	e. kept alkali metals under its surface.

1. .... 2. .... 3. .... 4. ....

C Mention an example of a metalloid used in the manufacture of electronic devices and an example of a transition element used in food preservation.

....

Question 4 14 marks

A **Put (✓) or (✗) :**

1. The modern periodic table consists of 17 horizontal periods and 8 vertical groups. (   )
2. Solutions of metal oxides turn blue litmus paper into blue. *(Dream Sch. / Giza 2020)* (   )
3. Sodium is used in the manufacture of electronics. *(Bloom Sch. / Giza 2020)* (   )
4. Hofmann's voltameter is used for water electrolysis. *(Essmat Sch. / Alex. 2020)* (   )

B **What happens when ... ?**

1. Dumping the atomic wastes in oceans and seas.

....

2. Adding dil. HCl to a piece of carbon. *(Manaret Alfarouk Sch. / Cairo 2020)*

....

C The River Tufdal in Norway was famous for the migration of salmon fish in a specific season of each year. It was noticed that the migration of these fish was stopped after construction of several factories on both banks and the dependence of farmers in its vicinity on chemical pesticides in resisting agricultural pests.

What is your explanation for stopping the migration of fish in the light of these previous conditions ?

....

....

....

Model Exam 2

56

Answer the following questions

Question 1 14 marks

A **Complete the following sentences :**

1. The modern periodic table consists of .... horizontal periods.
2. Elements .... , ... and .... are examples of halogens.
3. $Mg + 2HCl \xrightarrow{dil.}$ .... + ... *(Science Inspectorate / El-Sharkia 2023)*
4. In Hofmann's voltameter .... is the positive pole, while .... is the negative pole.

B Illustrate with chemical equations only the reactions of the following :

1. Reaction of magnesium with dilute hydrochloric acid.

....

2. Reaction of carbon with oxygen.

....

C What happens when ... ?

An element loses an electron. *(Essmat Abd El-Mageed Sch. / Alex. 2020)*

....

Question 2 *14 marks*

A Put (✓) or (✗) :

1. The angle between two single covalent bonds of water is 104.5° ( )
2. Bohr discovered the seven main energy levels in the known heaviest atom. *(Science Inspectorate Kafr El-Sheikh 2020)* ( )
3. The boiling point of liquefied nitrogen is (–196°C). ( )
4. Each period in the modern periodic table starts with inert gas. ( )

B Give reasons for :

1. It is dangerous to eat fish containing high concentration of lead.

....

....

2. Both nitrogen and lithium are located in the same period.

....

....

C Mention the difference between chlorine and bromine (concerning : the physical state).

....

Question 3 *14 marks*

A Choose the correct answer :

1. The elements of modern periodic table are classified into ....

   a. one block. b. two blocks. c. three blocks. d. four blocks.

2. Formation of .... occurs when an atom of nonmetallic element gains an electron or more during chemical reactions.

   a. positive ion b. negative ion c. excited atom d. metal atom

3. Element .... is used in preservation of cornea of the eye.

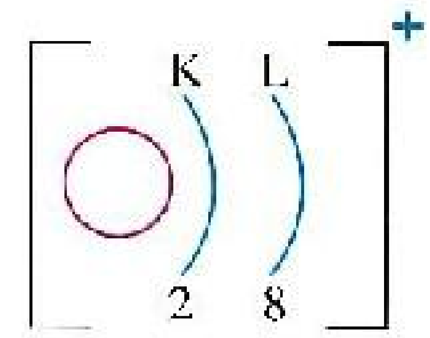
   a. silicon   b. radioactive cobalt 60

   c. liquefied nitrogen   d. liquid sodium

4. If the summation of volumes of gases in Hofmann's voltameter is 60 cm^3, so the volume of hydrogen gas and oxygen gas respectively equals ....

   a. 20 , 40   b. 40 , 20   c. 30 ; 30   d. 10 , 50

B The opposite figure shows the electronic configuration of the ion of an element :



Complete :

1. The number of the period where this element belongs to is ....
2. The block where this element belongs to is ....
3. The type of the element is ....
4. The nearest inert gas to this element is ....

C What is the importance of liquid sodium ? *(Degla Valley Sch. / Cairo 2020)*

....

Question 4 *14 marks*

A The opposite figure represents the second period and the third period in the modern periodic table :

	1A	2A	3A	4A	5A	6A	7A	0
Second period	A	Y		Q		D		Z
Third period	X	B					C	

[NB. The letters in the table don't represent the actual symbols of elements]

Complete the following :

1. The name of the element (A) is ....
2. The chemical formula for the compound produced from combination of element (X) with element (C) is ....
3. The type of oxide of element (Q) is ....
4. The physical state of element (C) at room temperature is ....

B Compare between elements of group (1A) and group (7A) concerning (Name – Valency – Kind of formed ions – Block).

Points of comparison	Elements of group (1A)	Elements of group (7A)
Name :		....
Valency :		....
Kind of formed ions :		....
Block :		....

C If you have an element with 2 electrons in the first energy level, and 7 electrons in second energy level.
What is the atomic number of this element, and mention if it is a metal or a nonmetal.

....

UNIT **2**

Lesson One

The Atmospheric Layers

Worksheet 12

1. A. Choose the correct answer :

1. The device which is used in measuring the altitude above sea level is the ....
   a. altimeter. b. aneroid. c. thermometer. d. Hofmann's voltameter.

2. The density of air .... by increasing the elevation above the sea level.
   a. increases b. decreases c. doesn't change d. is doubled

3. The.............. is a layer extends from the sea level to the tropopause.
   a. troposphere b. stratosphere c. mesosphere d. thermosphere

4. The.............. is a layer extends from stratopause to mesopause.
   (St. Joseph Sch. / Cairo 2020)
   a. troposphere b. stratosphere c. mesosphere d. thermosphere

5. The atmospheric pressure on the top of a mountain is .... the atmospheric pressure at the sea level.
   a. more than b. less than c. equal to d. half

6. The.............. is located between stratosphere and mesosphere. *(Bloom Sch. / Giza 2020)*
   a. tropopause b. stratopause c. mesopause d. thermopause

B. Problem :

If the temperature at the foot of Everest mountain is 20.6°C. Find the temperature at its top of height 8862 m above Earth's surface. *(El-Helmia Official Lang. Sch. / Cairo 2022)*

....

....

2. Give reasons for :

1. Most of weather conditions take place in troposphere layer.

   ....

2. The troposphere layer regulates the Earth's temperature.

   ....

3. The atmospheric pressure in troposphere layer decreases on going above sea level.
   (St. Joseph Sch. / Cairo 2022)

   ....

4. The air motion is vertical in the troposphere layer. *(El-Tur Zone / South Sinai 2020)*

   ....

3. Complete the following statements :

1. The thickness of troposphere layer is about .... *(St. Joseph Sch. / Cairo 2020)*
2. As we go up 1 km above the sea level, the temperature .... with ....
3. Most weather features occur in .... *(El-Montazah Zone / Alex. 2023)*
4. Troposphere layer contains about .... of the total mass of the atmospheric air and about .... of the total amount of atmospheric water vapour.
5. The aneroid is used to ....
6. The .... is a device used to measure the altitude of aeroplanes above sea level.

4. A. 1. Compare between :

The atmospheric pressure and the atmospheric envelope [in the view of definition].

The atmospheric pressure	The atmospheric envelope
....	....
....	....
....	....

2. Calculate the height of a mountain if the temperature at its foot is 19°C and at its top is 6°C.

....

B. Arrange :

1. The layers of atmospheric envelope [starting from the higher pressure to the lower pressure].

....

2. The atmospheric layers [starting from the farthest to the Earth's surface].

....

C. Put (✓) or (✗), then correct what is wrong :

1. There is about 50% of the total mass of atmospheric air in the area between sea level and 3 km height. (   )

....

2. The normal atmospheric pressure at sea level equals 76 mbar. (   )

....

3. Troposphere layer contains most of atmospheric turbulences. (   )

....

Worksheet 13

1. A. Complete the following statements :

1. The thickness of stratosphere is .... , while that of mesosphere is ....
2. Luminous .... are formed in mesosphere layer due to its friction with ....
3. The highest temperature layer in the atmosphere is .... and the lowest temperature one is .... *(Al Bayan Lang. Sch. / Cairo 2023)*
4. Ozone layer is located in .... layer. *(Eng/M.M Yacoub formal Sch. / Aswan 2020)*
5. Van-Allen Belts surround ....

B. What is meant by ... ?

1. Aurora phenomenon : .... *(Qus official Sch. / Qena 2020)*
....
2. Van-Allen Belts : ....
....
3. Exosphere region : ....
....
4. Ionosphere : ....
....

C. What happens when harmful cosmic radiations reach the ionosphere ?

(El-Gharbia 2020)

....

2. A. The opposite figure exhibits the temperature changes in the layers of atmospheric envelope :

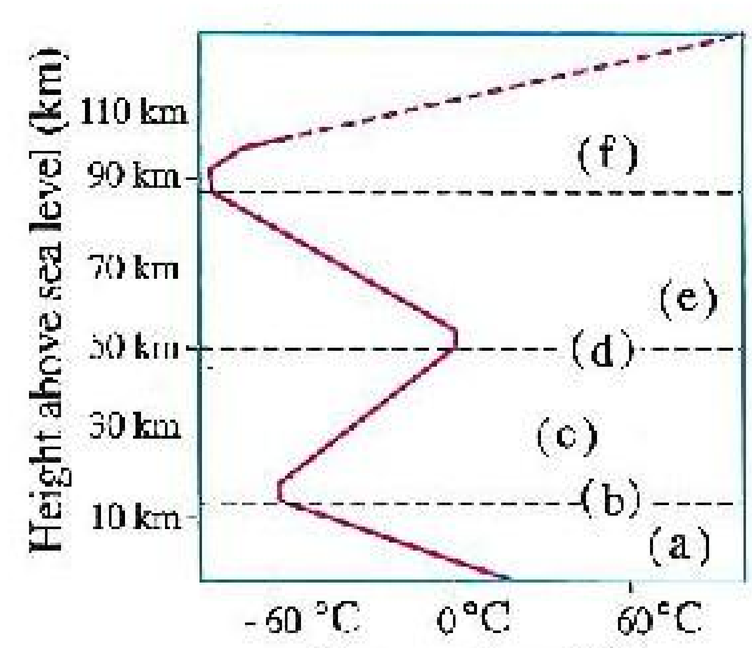
(Eng/M.M Yacoub formal Sch. / Aswan 2020)

Write the suitable labels that are represented by letters on the figure :

a. ....   b. ....

c. ....   d. ....

e. ....   f. ....



B. Put (✓) or (×), then correct what is wrong :

1. Satellites orbit around the Earth in exosphere region. ( )

....

2. The air moves horizontally in the lower part of stratosphere. ( )

....

3. Troposphere is important for wireless communication. ( )

....

4. Ozone layer is found in thermosphere layer. ( )

....

C. 1. Compare between :

The troposphere layer and the mesosphere layer [in the view of : pressure and temperature]

P.O.C.	The troposphere layer	The mesosphere layer
- Pressure :		....
- Temperature :		....

2. What is the importance of Van-Allen Belts ? *(Rasheed Zone / Behiera 2023)*

....

3. A. Give reasons for :

1. The lower part of stratosphere is suitable for flying aeroplanes. *(Manaret Al Farouk Islamic Sch. / Cairo 2020)*

....

2. Ionosphere plays an important role in communication. *(East Mansoura Zone. / El-Dakahlia 2020)*

....

3. The temperature increases as we go higher in stratosphere layer.

....

4. The stratosphere layer is called the ozonic atmospheric envelope.

....

5. The upper part of thermosphere is called ionosphere.

....

B. Compare between : Troposphere and stratosphere layers. (concerning : thickness and air movement) *(Science Inspectorate / Qena 2023)*

P.O.C.	Troposphere layer	Stratosphere layer
- Thickness :		....
- Air movement :		....

4. A. What is the importance of ... ?

1. Ozone layer : .... *(Damietta 2020)*
2. Satellites : ....
3. Thermosphere : ....

B. Choose the correct answer :

1. The planes fly in .... layer.
   a. troposphere b. stratosphere c. mesosphere d. thermosphere
2. .... layer extends from tropopause to stratopause.
   a. Troposphere b. Stratosphere c. Mesosphere d. Thermosphere
3. Charged cosmic radiations reflect in .... layer.
   a. troposphere b. stratosphere c. mesosphere d. ionosphere
4. Ionosphere is surrounded by two .... belts. *(Sherif Talat Sch. / El-Sharkia 2020)*
   a. magnetic b. ionic c. electric d. heat
5. Meteors are formed in .... layer. *(Manaret Heliopolis Sch. / Cairo 2020)*
   a. mesosphere b. ionosphere c. exosphere d. stratosphere

UNIT **2**

Lesson Two

Erosion of Ozone Layer and Global Warming

Worksheet 14

1. Put (✓) or (✗) :

1. The ozone molecule is formed by bonding free oxygen atom with an oxygen molecule. ( )
2. Ozone layer extends from 20 km to 30 km height above the sea level. ( )
3. Far ultraviolet rays penetrate the ozone layer with a percentage 100% ( )
4. Erosion of ozone layer and global warming phenomenon are from the dangerous phenomena that face planet Earth atmosphere. *(Bloom Sch. / Giza 2020)* ( )

2. Write the scientific term :

1. A type of ultraviolet radiations that is absorbed completely (100%) by the ozone layer. *(Damietta directorate / Damietta 2022)* (..........................)
2. Thinning or losing parts of ozone layer. *(Egypt Dream Lang. Sch. / Cairo 2022)* (..........................)
3. A useful gas for the planet Earth, that is formed in the stratosphere layer. (..........................)
4. A unit measures the degree of ozone. *(Leaders Shc. / Alex. 2020)* (..........................)

3. A. Explain by equations the role of ultraviolet radiations in the formation of ozone gas.

....

....

B. 1. What is meant by standard temperature and pressure ?

....

....

2. What is the importance of ozone layer ? *(St. Joseph Sch. / Cairo 2020)*

....

....

4. A. Complete the following statements :

1. The ozone layer absorbs the .... rays away from the Earth's surface.
2. The type of ultraviolet rays that penetrates the ozone layer with a percentage 100% is ....
3. Nanometre = ... m.
4. In .... each year, erosion of ozone layer increases above the .... pole.

B. Give reasons for :

1. Increasing the size of ozone hole in September every year.

....

....

2. Formation of ozone layer in the stratosphere layer. *(Dokki Zone / Giza 2023)*

....

....

Worksheet 15

1. Mention :

1. The reasons for increasing CO_2 gas ratio in the atmosphere.

....

....

2. The use of halons.

....

2. A. What is meant by ... ?

- IPCC : ....

....

B. Choose the correct answer :

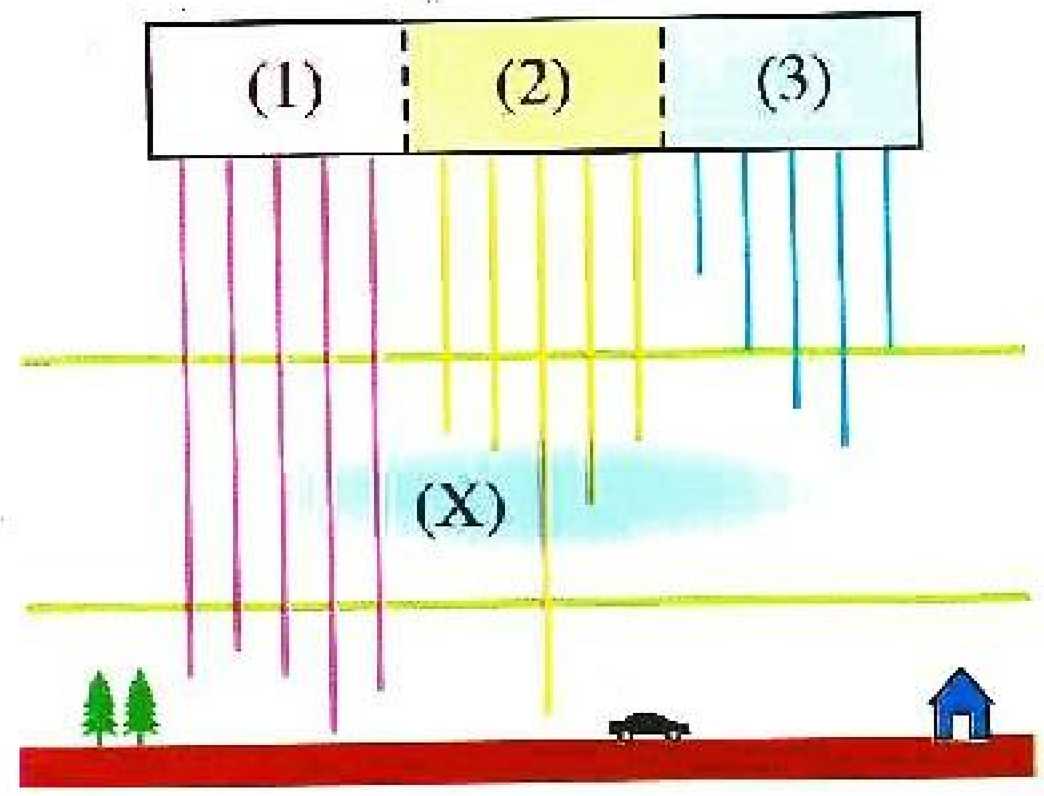
1. .... is/are used as cooling substance in cooling devices.
   a. Freon b. Halons
   c. Nitrogen oxides d. Methyl bromide gas

2. .... result(s) from the burning of fuel of ultrasound aeroplanes (concorde).
   a. Methyl bromide gas b. Nitrogen oxides gases
   c. Halons d. Freon

3. .... is/are used as an insecticide to preserve stored agricultural crops.
   a. Nitrogen oxides gases b. Freon
   c. Methyl bromide gas d. Halons

3. A. From the opposite figure :

1. What do the rays (1) , (2) and (3) represent ?
2. What is the thickness of layer (X) ?



B. What happens when overuse of freon ?

(El-Salam Sch. / Luxor 2020)

....

4. A. Put (✓) or (✗), then correct what is wrong :

1. Methyl bromide is used in extinguishing fires. (   )

....

2. Methane gas and nitrous oxide gas are considered from greenhouse gases. (   )

....

3. Halogens are produced from ultrasound aeroplanes. (   )

....

B. Mention the pollutants of ozone layer.

....

....

....

Worksheet 16

1. A. What would happen if ... ?

1. Earth's temperature increases [concerning : the climatic changes].

....

2. The melting rate of polar ice is increased [concerning : the coastal areas].

....

3. The percentage of nitrogen oxides gases in the atmospheric envelope increases.

....

4. Infrared radiations don't reemit back from troposphere layer.

....

B. What is meant by greenhouse effect ? *(Damietta 2020)*

....

....

2. Complete the following statements :

1. Both of .... and .... are from the examples of the climatic changes produced by global warming.
2. The ultraviolet radiation has a .... effect, while the infrared radiation has a .... effect. *(Amoun Lang. Sch. / Giza 2023)*
3. The glass permits the passage of .... and .... rays coming from the Sun to be absorbed by Earth in the greenhouse.
4. Global warming phenomenon means ....

3. A. Give reasons for :

1. Melting of ice and snow of both south and north poles.

....

2. Infrared radiation cannot penetrate the Earth's atmosphere.

....

3. Burning of fossil fuel should be reduced.

....

4. Increasing CO_2 gas percentage in the atmosphere. *(Leaders lang. Sch. / Cairo 2022)*

....

B. Choose the correct answer :

1. Global warming happens due to all the following reasons except ....
   a. the lack of CO_2 in the atmospheric envelope.
   b. the increase of the amount of CO_2 in the atmospheric envelope.
   c. the lack of plants on Earth.
   d. the burning of fossil fuel.

2. The erosion of the ozone layer differs from a year to another due to ....

a. increasing the amount of pollutants.

b. the lack of plants on the Earth.

c. the lack of CO_2 in the atmospheric envelope.

d. the lack of ozone gas in the atmospheric envelope.

3. The increase of CO_2 percentage is caused by all of the following reasons except ....

a. cutting trees. b. burning forests.

c. burning fossil fuel. d. increasing green areas.

4. Melting of ice in the north and south poles leads to the extinction of polar animals like ....

a. crocodiles. b. deers. c. monkeys. d. polar bears.

5. Ozone layer doesn't allow the passage of all .... ultraviolet rays.

a. far b. medium c. near and medium d. far and medium

(Science Inspectorate / Qalyoubia 2023)

6. All of the following gases are greenhouse gases, except ....

a. CO_2 b. O_2 c. N_2O d. CH_4

(Badr Lang. Sch. / Cairo 2023)

General Exercise of the School Book ? on Unit Two

1. Replace each of the following statements by a suitable scientific term :

1. The boundary separating between stratosphere and mesosphere where temperature is rather constant. (..............)
2. Charged layer reflects radio waves. (..............)
3. One of the atmosphere components that its ratio increased in recent years to reach about 0.038 % (..............)
4. A type of ultraviolet radiation that is absorbed completely (100%) in the ozone layer. (..............)

2. Complete the following phrases :

1. The highest temperature layer in the atmosphere is .... and the least temperature one is ....
2. Most of weather features occur in .... layer, whereas satellites revolve through the .... layer.
3. Ultraviolet radiation has a .... effect, and the infrared radiation has a .... effect.
4. Among the pollutants of the ozone layer are .... compounds that are used in air conditioning sets, and .... compounds that are used in fire extinguishers.

3. Illustrate with formulas only the role of ultraviolet radiation in the formation of ozone gas.

....

....

4. An aeroplane captain announced that the atmospheric pressure outside the aeroplane is 90 millibar. In which layer of the atmosphere was the plane flying ? Why ?

....

....

5. Compare between mesosphere and thermosphere in terms of temperature, importance and air pressure.

P.O.C.	Mesosphere	Thermosphere
• Temperature :		....
• Importance :		....
• Air pressure :		....

6. Calculate the height of a mountain if the temperature at its foot is 30°C and at its top is (– 6°C).

....

....

Model Exams on Unit 2

Model Exam 1

56

Answer the following questions :

Question 1 — 14 marks

A Choose the correct answer :

1. Troposphere contains about .... % of the total mass of atmospheric air.

   a. 50 b. 60 c. 75 d. 90

2. .... layer is surrounded by Van-Allen Belts.

   a. Troposphere b. Stratosphere c. Ionosphere d. Mesosphere

3. Pilots prefer to fly in the .... of stratosphere layer.

   a. upper part b. lower part c. front d. middle part

4. .... gas is produced from the reaction between sodium bicarbonate and vinegar.

   a. CH_4 b. N_2O c. H_2O d. CO_2

B Correct the underlined words :

1. **Troposphere** is the coldest layer. (..............)

   (Akhnaton Egyptian Sch. / Cairo 2020)

2. Luminous meteors are formed in the **troposphere** layer. (..............)

3. **Methyl bromide** used in extinguishing fires. (..............)

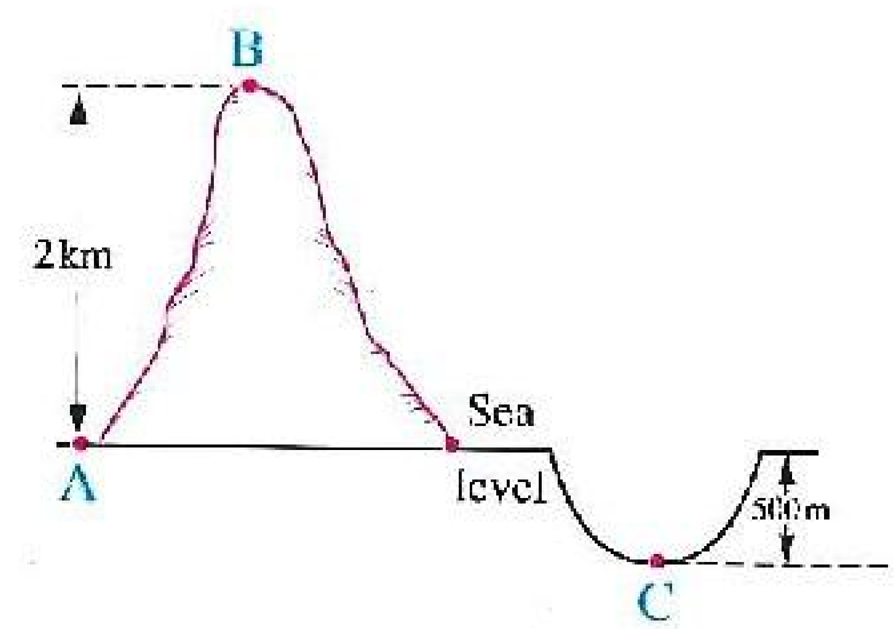
   (Manaret Heliopolis Sch. / Cairo 2020)

4. **Ultraviolet** radiation has thermal effect. (..............)

C From the opposite figure :

Calculate the temperature at points (A), (B) and (C).

If you know that the temperature at the middle of the mountain is 0°C.



Question 2 14 marks

A Put (✓) or (✗) :

1. Chlorofluorocarbon compounds are dangerous to the environment. ( )
2. Van-Allen Belts are called by this name related to the aurora phenomenon. ( )
3. Mesosphere is called thermal layer. ( )
4. Radio waves are reflected at troposphere layer. *(El-Tur Zone / South Sinai 2020)* ( )

B Give reasons for :

1. Van-Allen Belts play an important role in protecting the Earth.

   ....

2. The upper part of thermosphere layer is called ionosphere.

   ....

C What is meant by global warming phenomenon ? *(Science Inspectorate / Qena 2023)*

....

....

Question 3 14 marks

A Complete the following statements :

1. All of .... , ... and forests fires are the reasons of increasing greenhouse gases percentage in the atmosphere.
2. Wind moves from the areas of .... atmospheric pressure to that of .... atmospheric pressure.
3. The air movement in .... layer is vertical, while in .... layer is horizontal.
4. In the atmospheric envelope, the .... is the fourth layer and also it is called .... layer, because it is the hottest layer in the atmospheric envelope.

B What happens when ... ?

1. We go up above sea level [concerning the atmospheric pressure].

   ....

2. Oxygen atom combines with oxygen molecule.

   ....

C Mention the importance of the ionosphere.

....

Question 4 14 marks

A Write the scientific term :

1. Charged layer which reflects radio waves. (..............)

(Official Lang. Sch. / Giza 2023)

2. A phenomenon looks like a colorful light curtains seen in the two poles. (..............)

(Badr Lang. Sch. / Cairo 2023)

3. The region in which the atmospheric envelope is inserted in the outer space. (..............)

(Degla Valley Sch. / Cairo 2020)

4. It is the trapping of infrared radiation in the troposphere layer. (..............)

(Manaret Heliopolis Sch. / Cairo 2020)

B Choose the odd word out and write the relation between each of the others :

1. Oxygen / Nitrous oxide / Water vapour / Carbon dioxide. *(El-Gharbia 2020)*
2. Nitrogen oxides / water vapour / freons / Halons. *(El-Tur Zone. / South Sinai 2020)*
3. Destructive floods / Forests fires / Drought waves / Greenhouse effect.
4. Stratopause / Tropopause / Mesopause / Thermosphere.

C Stratosphere is called the ozonic atmospheric envelope because it contains the ozone layer. What are the changes that will occur in the temperature of troposphere and stratosphere in the absence of ozone layer **(Explain your answer).**

....

....

Model Exam 2

56

Answer the following questions :

Question 1 14 marks

A Complete the following statements :

1. The most known greenhouse gases are ...., CFC_s, ... and nitrous oxide gas.
2. The .... don't penetrate ozone layer by a percentage 95 %, while .... penetrates ozone layer by a percentage 100 %.
3. Scientist .... postulated that the thickness of the ozone layer if it is compressed, it will be ....
4. Ozone layer is extends from .... to .... km above sea level.

B **Give one example of each of the following :**

1. Greenhouse gases : ....

(El-Sahel Zone Sch. / Cairo 2023)

2. Barometers : ....

(El-Salam Sch. / Luxor 2020)

3. Pollutants of ozone layer : ....

(Amoun Lang. Sch. / Cairo 2023)

4. Severe climatic changes : ....

(Official Lang. Sch. / Giza 2023)

C **Compare between troposphere and mesosphere layers (according to there importance) :**

Troposphere layer	Mesosphere layer
....	....
....	....
....	....
....	....

Question 2 14 marks

A **Choose the correct answer :**

1. .... is the region between mesosphere and thermosphere.

a. Tropopause b. Stratopause c. Mesopause d. Thermopause

2. 1 bar = ... millibar (mbar).

a. 100 b. 10 c. 1000 d. 500

3. .... is/are used as a flating substance in making foam backing.

a. Chlorofluorocarbon compounds b. Nitrogen oxides gases

c. Methyl bromide gas d. Halons

4. The thickness of stratosphere layer is .... km.

a. 1000 b. 13 c. 50 d. 37

B **Write the scientific term :**

1. It is a type of ultraviolet rays that doesn't penetrates the ozone layer by a percentage 100 %. (..............)

2. A device used to determine the possible day weather based on atmospheric pressure.

(Borg El-Arab Zone. / Alex. 2020) (...............)

3. The weight of air column of an atmospheric height on a unit area. (...............)

(Shebien El Koum Directorate / Menofia 2022)

4. Curved lines that join the points of equal pressure in atmospheric pressure maps. *(Science Inspectorate / Gharbia 2022)* (...............)

C Give a reason for :

The stratosphere layer is called the ozonic atmospheric envelope.

....

Question 3 14 marks

A Correct the underlined words :

1. Water vapour is from **ozone pollutants.** (...............)
2. The temperature of the Earth increases due to the increase in the percentage of **oxygen** gas in the atmosphere than normal. (...............)
3. The thickness of mesosphere layer is **50 km**. (...............)
4. **Troposphere** is surrounded by to magnetic belts. (...............)

B What happens when ... ?

1. There are no Van-Allen Belts.

....

2. Overuse of freon.

....

C If the temperature at the top of a mountain is (– 4°C) and at a point in the middle of its height is (9°C).

Calculate : 1. The height of the mountain.

2. The temperature at the foot of the mountain.

Question 4 14 marks

A Put (✓) or (✗) :

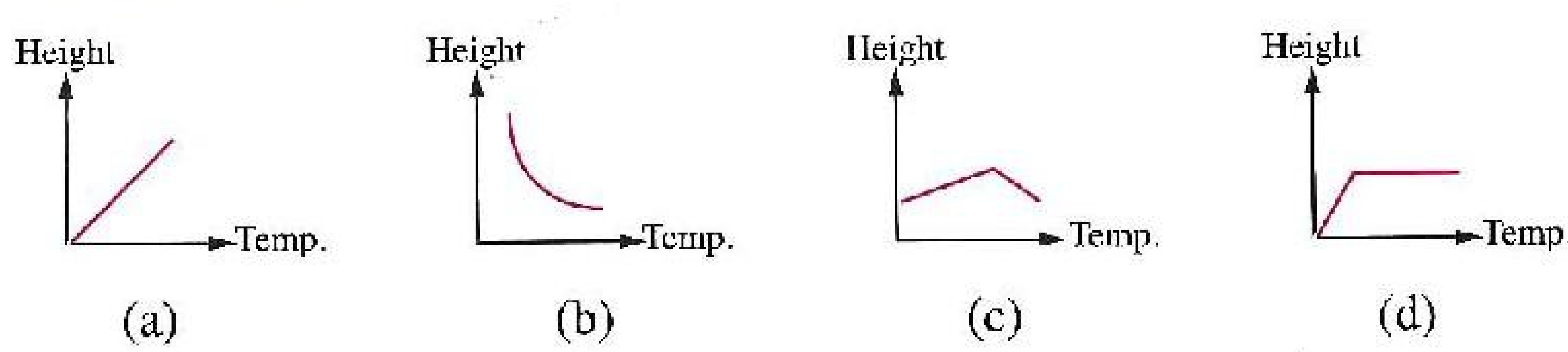
1. Infrared radiation has a chemical effect. *(Dokki Zone Sch. / Giza 2023)* ( )
2. Methyl bromide gas is used as an insecticide. *(Bloom Sch. / Giza 2020)* ( )
3. Temperature decreases by 6.5°C at 2 km above sea level. ( )
(Essmat Abd El-Mageed Sch. / Alex. 2020)
4. The millibar is the unit of measuring the ozone degree.
(Science Inspectorate / El-Sharkia 2023) ( )

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Van-Allen belts	a. revolve around the Earth in a region called the exosphere.
2. Altimeter	b. are responsible for scattering the harmful cosmic rays away from the Earth.
3. Satellites	c. is a brightly coloured light curtains seen at the both poles of the Earth.
4. Aurora phenomenon	d. is used to measure the elevation of aeroplane above sea level.
	e. is used to determine the possible day weather.

1. .... 2. .... 3. .... 4. ....

C Mention the change in temperature by transferring 7500 metres upwards, then choose the correct diagram to illustrate your answer : *(Manaret El Farouk Islamic Sch. / Cairo 2020)*



UNIT 3
Lesson One

Fossils

Worksheet 17

1. Choose the correct answer :

1. Complete body fossils of insects are found preserved in ....
   a. ammonites. b. igneous rocks. c. amber. d. water.
2. All the following are suitable conditions for fossil formation of any organism except that it ....
   a. has a hard skeleton.
   b. has a medium to protect it from decomposition.
   c. buried immediately after death. d. has a soft body.
3. What is the kind of fossil that is formed when a plant leaf falls on a soft sedimentary rock at the beginning of formation, then hardening ? ....
   a. Trace. b. Mold. c. Cast. d. Petrified fossil.
4. Mammoth fossil is an example of .... fossil. *(El-Salam Sch. / Luxor 2020)*
   a. cast b. mold c. complete body d. petrified

2. A. What is the difference between ... ?

1. Mammoth fossil and amber fossil :

Mammoth fossil	Amber fossil
....	....
....	....
....	....

2. Cast and mold : *(M.M Yacoub Formal Lang. Sch. / Aswan 2022)*

Cast	Mold
....	....
....	....
....	....

B. Mention :

1. One example for complete body fossil : .... *(Dream International Sch. / Giza 2020)*
2. The suitable conditions for fossils preservation : ....

....

3. One example for the trace : .... *(Akhnaton Egyptian Sch. / Cairo 2020)*

3. A. Mention the name and the type of each fossil illustrated in the following figures :



Fig. (1)

....

....



Fig. (2)

....

....



Fig. (3)

....

....

B. What is meant by ... ?

1. Amber : ....
2. Petrification : ....

....

3. Fossils : .... *(Sherif Talat Sch. / El-Sharkia 2020)*

....

4. A. Give reasons for :

1. The petrified woods are considered from fossils although they look like rocks.

(Eng/M.M Yacoub Formal Sch. / Aswan 2020)

....

2. Naming the area of the petrified forests with wood mountain.

(Official Lang. Sch. / Giza 2023)

....

3. Amber is considered as a suitable medium for formation of complete body fossils.

....

B. Complete the following sentences :

1. The suitable medium for formation the mammoth fossil is ....
2. When the snail shell of ammonites decomposes, it will leave .... which carries the .... details for the snail.
3. The resinous matter is secreted from .... which were common during some old geological ages.
4. Fossils always exist in the .... rocks.

Worksheet 18

1. A. Complete the following statements :

1. The presence of microfossils as radiolaria and foraminifera in the rocks of the exploratory wells points to the .... of rocks existed in them and the suitable conditions of .... formation.
2. Archaeopteryx represents the link between .... and .... *(Official Lang. Sch. / Giza 2023)*
3. Fossils are important for studying .... and figuring out the ....
4. .... fossil is present in .... rocks of El-Mokattam mountain.

B. What is meant by index fossils ? *(Damietta 2020)*

....

....

2. Correct the underlined words :

1. Petrified woods are considered from **rocks**. *(Manaret Heliopolis Sch. / Cairo 2020)* (........................)
2. **Nummulites** fossils are used in determination the age of sedimentary rocks. *(Science Inspectorate / Qena 2023)* (........................)
3. **Ammonites** fossils indicate that the environment where they lived was clear warm shallow seas. (........................)
4. Ferns fossils indicate that the environment where they lived was **a sea floor**. *(Ashmoon Zone / El-Menofia 2020)* (........................)
5. The trace is what the living organism leave **after its death** in the sedimentary rocks. *(Science Inspectorate / Minia 2023)* (........................)
6. Worms' tunnels fossil is from **remains** of old living organisms. (........................)

3. A. Give reasons for :

1. Geologists search for foraminifera and radiolaria fossils.

....

2. El-Mokattam mountain was a part of a sea floor more than 35 million years ago.

(Agamy Directorate / Alex. 2022)

....

B. Mention one use for :

1. Index fossils.

....

2. Fossils.

....

4. A. Choose the correct answer :

1. Not all the fossils are considered index fossils, because index fossils are characterized by ....
   a. a long period of time and a limited geographic distribution.
   b. a short period of time and a wide geographic distribution.
   c. a long period of time and a wide geographic distribution.
   d. a short period of time and a limited geographic distribution.

2. The fossil record points to the evolution of life from simple to complex in the plants and the proof is that ....
   a. the angiosperms appeared before gymnosperms.
   b. the ferns appeared before mosses.
   c. the algae appeared before mosses and ferns.
   d. the mosses appeared before the algae.

3. The fossils that exist in the sedimentary rocks of El-Mokattam mountain are .... fossils.
   a. ferns b. coral c. nummulites d. ammonites

4. .... is an example of microfossils. *(Badr Lang. Sch. / Cairo 2023)*
   a. Mammoth b. Fern c. Foraminifera d. Coral

B. Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Fossils indicate the details of the life of an old plant.	a. radiolaria.
2. A fossil indicates the suitable conditions of petroleum formation.	b. archaeopteryx.
3. A fossil is considered a link between reptiles and birds.	c. corals.
4. Invertebrates fossils were appeared before vertebrates on the life stage.	d. petrified woods.
	e. dinosaurs.

1. .... 2. .... 3. .... 4. ....

UNIT **3**

Lesson Two

Extinction

Worksheet 19

1. A. Correct the underlined words :

1. **The violent Earth movement** is one of the most important causes of extinction in recent ages. (......................)
2. **Quagga** is from the most famous extinct species in the old times. (......................)
3. **Dinosaur** is considered from the extinct species in the recent times. (......................)
4. **Pigeon** is from birds that can't fly due to the reduced size of its wings. (......................)

B. What is meant by ... ?

Extinction : .... *(Degla Valley Sch. / Cairo 2020)*

....

2. A. Mention the causes of the macro extinctions.

....

....

....

B. Look at the pictures of these land animals, then mention the name of each one and classify it as extinct or endangered :



(1) ....

....



(2) ....

....



(3) ....
....



(4) ....
....

3. A. Complete the following statements :

1. .... is an example of endangered plants in Egypt which is used by pharaohs in manufacturing of ....
2. .... is from endangered birds, while .... is from endangered mammals.
3. .... is from recently extinct birds, while .... is from recently extinct mammals.

(Science Inspectorate / Giza 2023)

4. From the extinct animals in the old ages are .... and ....

B. Read these statements, then answer the following questions :

(a) A bird its head is covered with white feathers.

(b) A non-flying bird.

Questions :

1. Name each species ?

....

2. Determine if it is extinct or endangered ?

....

....

4. A. Give a reason for :

Dodo bird was an easy target to be hunted.

....

B. Mention one difference between dodo bird and bald eagle.

Dodo bird	Bald eagle
....	....
....	....

Worksheet 20

1. A. Mention three ways to protect living organisms from extinction.

(Lycee El-Haram Sch. / Giza 2020)

....

....

....

B. Give reasons for :

1. Complicated ecosystem is not affected by the absence of one of its species.

....

2. The desert is a simple ecosystem. *(Damietta 2020)*

....

2. Mention one difference between complicated and simple ecosystems.

(West Fayoum Zone / Fayoum 2023)

Complicated ecosystem	Simple ecosystem
....	....

3. A. Complete the following table :

Protectorate	Location	Protected kind
(1)	South Sinai governorate	....
(2) Panda protectorate		....
(3)		Grey bear

B. Put (✓) or (✗) :

1. Wadi El-Raiyan is the first established protectorate in Egypt in 1983 ( )
2. Tropical forest is an example of complicated ecosystem. ( )
3. Yellowstone protectorate is found in northeastern China. ( )

(El-Santa Zone / El Gharbia 2023)

4. A. What is meant by ... ?

1. Natural protectorates : ....

....

2. Food chain : ....

B. Choose from the following scientific terms what is suitable for the short statements :

Scientific terms	The statements
1. The protectorate of petrified forests in Qattamiya	a. is present in nature shaped as a chin.
	b. in which, the grey bear is protected.
2. Panda protectorate	c. is located in northeastern China.
3. Wadi El-Hetan, part of Wadi El-Raiyan protectorate in El-Fayoum	d. in which, the petrified woods are found over 35 million years.
4. Ras Mohamed protectorate	e. is formed from limestone rocks.
5. El-Mokattam mountain region	f. is the best world heritage area of whales' skeletons.

1. .... 2. .... 3. ....

4. .... 5. ....

General Exercise of the School Book on Unit Three

1. Choose the correct answer :

1. Fossils are often found in .... rocks.
   a. metamorphic b. sedimentary c. volcanic d. igneous
2. All of the following are endangered species except ....
   a. panda. b. bald eagle. c. quagga. d. rhinoceros.
3. All of the following are natural disasters that threaten living organisms except ....
   a. floods. b. volcanoes. c. drought waves. d. global warming.

2. Define each of the following :

1. Fossils : ....

....

2. Index fossil : ....

....

3. Natural protectorates : ....

....

3. Correct the following statement without changing the underlined phrases :

1. The first discovered fossil of **mammoth** were found preserved in amber. (......................)
2. **Ferns fossils** indicate that they lived in mild environment. (......................)
3. **Destroying the habitat** is one of the factors that contribute to species adaptation.

(......................)

4. Mention three ways to protect living organisms from extinction :

....

....

....

5. Give reasons for :

1. Petrified woods are considered from fossils although they look like rocks.

....

....

2. Fossils are important in petroleum exploration.

....

....

3. The simple ecosystem is significantly affected by the absence of one of its species.

....

....

6. Which of the following represents a mold or a cast ... ?

1. Gold alloy : ....

2. Cubes of ice : ....

3. Wax Museum statues in Helwan : ....

4. Models of clothes shows : ....

5. Face of a coin on clay : ....

Model Exams on Unit 3

Model Exam 1

56

Answer the following questions :

Question 1 14 marks

A Choose the correct answer :

1. .... is an example of complete body fossils.
   a. Mammoth fossil b. Ammonites fossil
   c. Nummulites fossil d. Trilobite fossil
2. .... replace the wood material part by part of an old tree.
   a. Plastic b. Iron c. Minerals d. Copper

(Manaret Heliopolis Sch. / Cairo 2020)

3. .... indicate(s) the age of sedimentary rocks.
   a. Ferns fossils b. Coral fossils c. Fossil record d. Index fossils
4. All of the following are extinct species except ....
   a. dodo bird. b. quagga. c. dinosaur. d. panda bear.

B Correct the underlined words :

1. **Mammoth** is an animal which extinct in recent times. (........................)

(Akhnaton Egyptian Sch. / Cairo 2020)

2. The complete body fossil of mammoth is found preserved in **amber**. (........................)

(Official Lang. Sch. / Giza 2023)

3. Studying the fossil record showed that the first vertebrates that appeared were **mammals**.

(Borg El-Arab Zone. / Alex 2020) (........................)

4. Panda bear is from **extinct** species. *(Ashmoon Zone / El-Menofia 2020)* (........................)

C Study the following food chain, then answer the questions :

Algae ⟶ Small fish ⟶ Big fish ⟶ Man

1. What would happen in the absence of small fish ?

....

2. What is the type of this ecosystem if you know that it is strongly affected in the absence of algae ?

....

Question 2 14 marks

A Put (✓) or (✗) :

1. The area of petrified forests in Qattamiya is called the wood mountain. ( )
2. Coral fossils indicate that the environment, where they lived was hot and rainy. ( )
3. Dinosaur and mammoth are examples of extinct species in recent times. ( )
4. Archaeopteryx is considered a link between reptiles and mammals. ( )

B Give reasons for :

1. Snow is suitable medium for formation of complete body fossil.

....

2. Panda protectorate is an important protectorate.

....

C Mention the causes of the recent extinction :

....

....

Question 3 14 marks

A Complete the following statements :

1. .... plant is an .... plant and it was used by pharaohs in manufacturing of writing papers.
2. .... replace wood material part by part in the .... wood fossils.
3. .... and .... are examples of extinct species.
4. Algae appeared before .... and ....

B What happens if ... ?

1. An organism is buried fast after death in snow.

....

2. Minerals replace wood material part by part of an old tree.

....

C What is meant by fossils ?

....

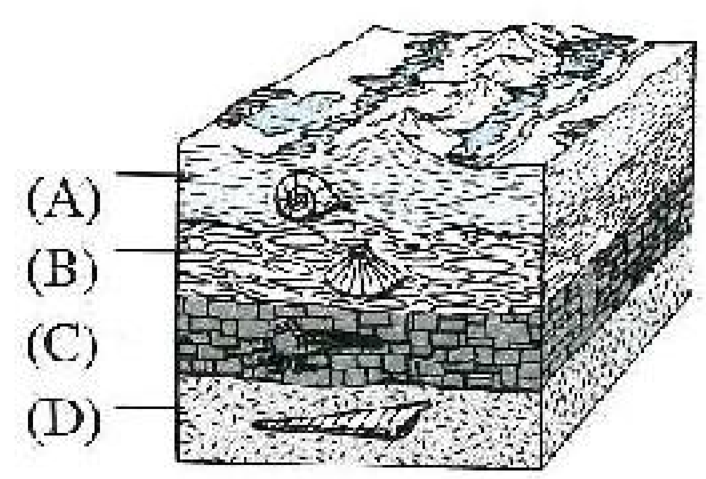
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Question 4 *14 marks*

A Write the scientific term :

1. The continuous decrease without compensation in the number of a certain species until all members die out. *(Science Inspectorate / Giza 2023)* (.......................)
2. They are safe areas established to protect endangered species in their homeland. *(Al Bayan Lang. Sch. / Cairo 2023)* (.......................)
3. Fossils used in determination of the age of sedimentary rocks. *(Manaret Al Farouk Islamic Sch. / Cairo 2020)* (.......................)
4. It is the replica of the internal details of living organisms after death. *(Bloom Sch. / Giza 2020)* (.......................)

B The opposite cross-section represents several rock layers that have not been overturned, each layer contains a type of fossils.



1. Explain why the fossil found in rock layer (A) is considered to be newer than the fossil in rock layer (D).

   ....

   ....

2. Circle the type of rock below that most likely includes rock layers (A), (B), (C) and (D) (Give an evidence to support your choice).

   Circle one : Igneous - Metamorphic - Sedimentary

   The evidence : ....

C Mention three ways to protect living organisms from extinction.

....

....

....

Model Exam 2

56

Answer the following questions :

Question 1 14 marks

A Complete the following statements :

1. .... is the most important protectorate in the USA, which was established to protect ....
2. .... and .... are examples of complete body fossils.
3. Simple ecosystem has .... and it is .... by the absence of one of its species.
4. Fossils are .... and .... of old living organisms that are preserved in sedimentary rocks.

B Mention one example for :

1. Simple ecosystem : .... *(Dokki Zone / Giza 2023)*
2. A natural protectorate : .... *(St. Joseph Sch. / Cairo 2020)*
3. A fossil of mold .... *(Degla Valley Sch. / Cairo 2020)*
4. An extinct bird in recent ages : .... *(Luxor Zone / Luxor 2023)*

C Compare between mold and trace :

P.O.C	Mold	Trace
Definition		....
Example		....

Question 2 14 marks

A Choose the correct answer :

1. .... is from extinct species.

a. Panda bear b. Rhinoceros c. Quagga d. Ibis bird

2. .... indicates the sequence of appearance of living organisms from simple to complicated.

a. Index fossil
b. Fossil
c. Fossil record
d. Nummulites fossil

3. Fossils that are found in the oldest layers of sedimentary rocks were formed from which types of organisms ? ....

a. Only organisms that lived in the sea.
b. Only organisms that lived on land.
c. Only organisms that lived in the air.
d. Organisms that lived on the land, in the sea and in the air.

4. Barbary sheep is from .... *(Bloom sch. / Giza 2020)*

a. extinct animals.
b. endangered animals.
c. animals that disappeared from zone.
d. dangerous animals.

B What happens if ... ?

1. Dipping the old insects in amber. *(Official Lang. Sch. / Giza 2023)*

....

2. The absence of one type of species from the simple ecosystem.

(Science Inspectorate / Giza 2023)

....

C From the following fossils :



(A)



(B)

Mention the name of each of them, then mention their importance for geologists.

....
....
....

Question 3 14 marks

A Correct the underlined words :

1. **Dodo bird** is an endangered species.

....

2. Reptiles appeared before **amphibians**.

....

3. In petrification, **plastic** replaced the wood material.

....

4. **Rhinoceros** is from extinct species.

....

B Give reasons for :

1. Importance of fossils in petroleum exploration.

....

....

2. Establishing gene banks of endangered species.

....

....

C What is meant by trace ?

....

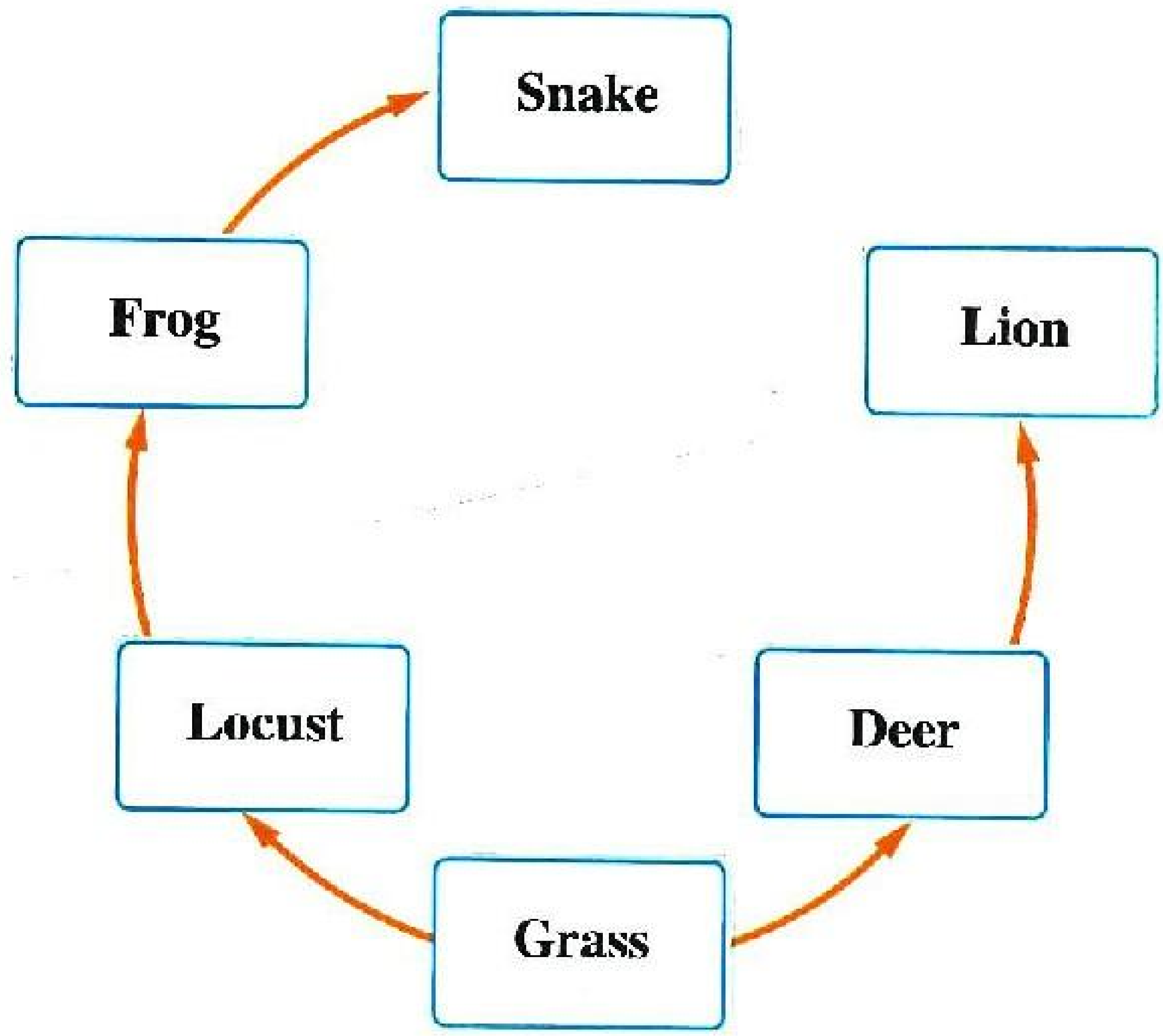
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Question 4 14 marks

A Put (✓) or (✗) :

1. Bald eagle is considered from extinct animals. *(Futures Sch. / Cairo 2020)* ( )
2. Foraminifera is considered as a microfossil. *(Bloom Sch. / Giza 2020)* ( )
3. Mammoth and dinosaurs are old extinct animals. *(Dream International Sch. / Giza 2020)* ( )
4. Ferns fossils indicate that the environments where they lived was clear warm shallow seas. ( )

B From the following diagram :



1. Identify two organisms in the food web that compete for food.

....

2. Explain why grass might increase if the population of snakes decreased.

....

....

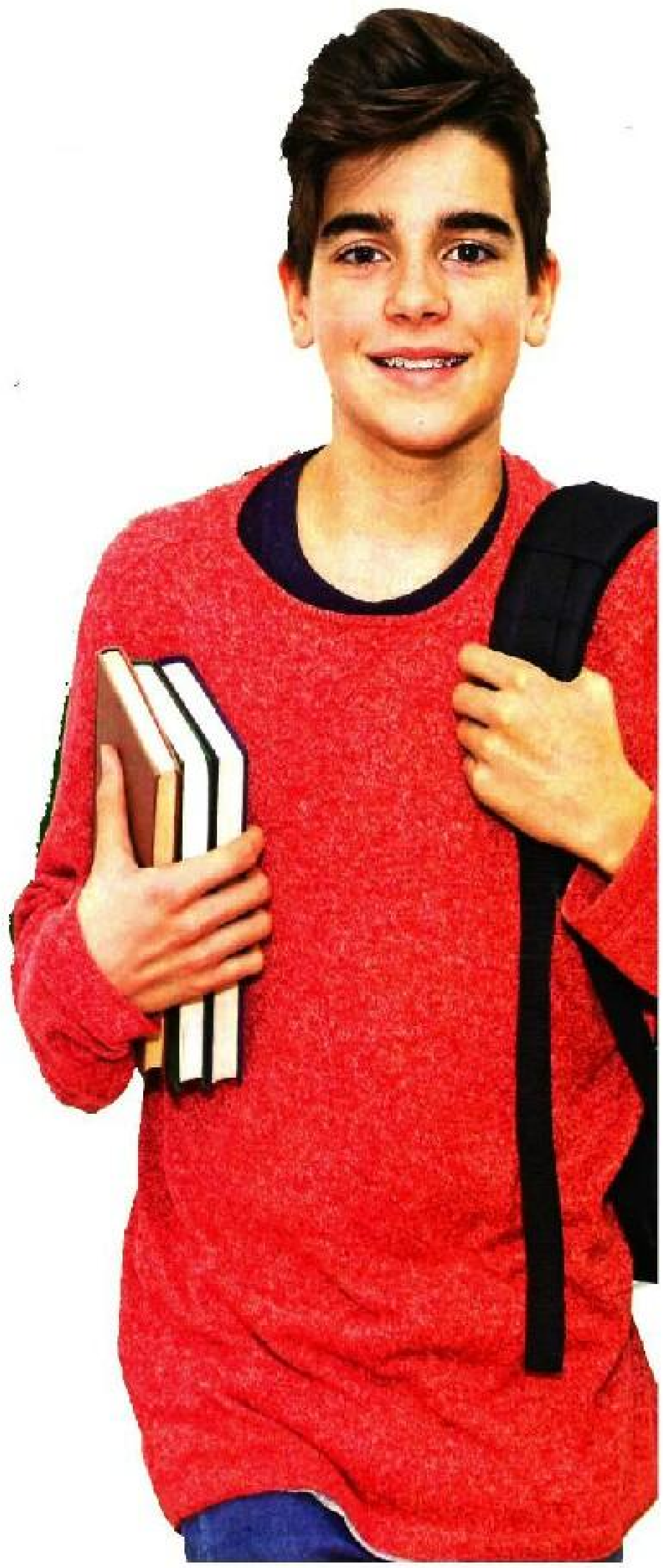
C Mention two examples of protectorates in Egypt :

1. ....
2. ....

Monthly Tests

October Tests.

November Tests.



October Tests

Model 1

Total mark

10

Question 1 — 5 marks

A Choose the correct answer :

1. The elements which occupy the middle block (d) in the periodic table are called .... elements.

   a. transition b. alkali c. acidic d. noble

2. Which of the following is an acidic oxide ? ....

   a. MgO b. CO_2 c. FeO d. CuO

3. The element whose atomic number (18) is ....

   a. transition element. b. inert gas.
   c. metallic element. d. halogen element.

4. Elements of group (7A) are known as ....

   a. inert gases. b. alkali metals. c. halogens. d. metalloids.

B Give a reason for the following :

Elements of group (1A) are known as alkali metals.

....

....

Question 2 — 5 marks

A Put (✓) or (✗) then correct the wrong ones :

1. Water and ammonia are from polar compounds. ( )
2. The modern periodic table is the first real table for classifying elements. ( )
3. Copper and Zinc don't react with water. ( )
4. Cobalt 60 emits gamma rays. ( )

B What happens when ... ?

Adding some water to magnesium oxide with shaking.

....

....

Model 2

Total mark
....
10

Question 1 — 5 marks

A Write the scientific term of each of the following :

1. They are nonmetallic oxides which dissolve in water forming acidic solutions. (..........................)
2. It is a table in which the elements are arranged in an ascending order according to their atomic numbers. (..........................)
3. It is the ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself. (..........................)
4. It is a part from million of the million part of a metre. (..........................)

B Give a reason for the following :

Mendeleev had to put more than one element in one cell.

....

....

Question 2 — 5 marks

A Put (✓) or (✗) :

1. Elements of p-black are organized in 5 groups. (   )
2. Alkali metals are monovalent element. (   )
3. The period number of an element equals the number of electrons in the outermost energy level in its atom. (   )
4. Copper and zinc don't react with water. (   )

B On adding a dilute hydrochloric acid to a magnesium ribbon (as shown in the figure), a gas is evolved :

1. Name the gas, how can you identify it ?

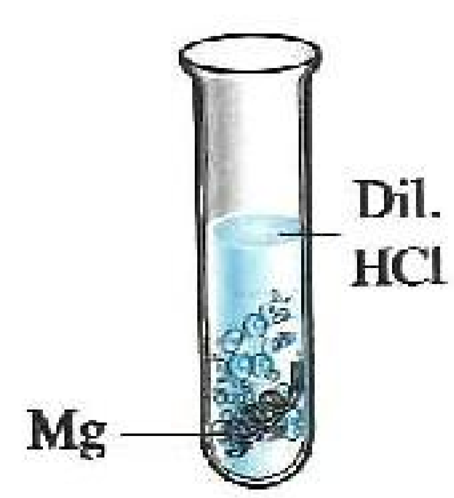
....

....

2. Write the balanced symbolic equation which expresses this reaction.

....

....



November Tests

Model 1

Total mark
....
10

Question 1 — 5 marks

A Choose the correct answer :

1. Pilots prefer to fly their planes in the lower part of .... , because there are no weather disturbance and air moves horizontally.
   a. thermosphere　b. mesosphere　c. troposphere　d. stratosphere
2. There are .... bonds among water molecules.
   a. hydrogen　b. covalent　c. ionic　d. metallic
3. .... radiation is characterized by thermal effect.
   a. Infared　b. Ultraviolet　c. Visible light　d. X-ray
4. Ionosphere layer is located in the upper part of .... layer.
   a. stratosphere　b. troposphere　c. mesosphere　d. thermosphere

B Give a reason for the following :

The abnormality of water is high.

....

....

Question 2 — 5 marks

A Put (✓) or (✗) :

1. Methyl bromide gas is used as an insecticide. (　)
2. The ozone layer allows the passage of all near and medium ultraviolet rays. (　)
3. Water density increases on freezing. (　)
4. Wind moves from regions of high atmospheric pressure to that of low atmospheric pressure. (　)

B What happens when ... ?

Increasing in the percentage of nitrogen oxides in the atmospheric envelope.

....

....

Model 2

Total mark
10

Question 1 5 marks

A Write the scientific term of each of the following :

1. The positive pole in Hofmann's Voltameter. (..........................)
2. The phenomenon that appears due to scattering of harmful charged radiations by Van-Allen Belts. (..........................)
3. A chemical compound used as a cooling material in air conditioning sets and refrigerators. (..........................)
4. The barometer used by pilots in aeroplanes to measure their elevations above the sea level. (..........................)

B Give a reason for the following :

The atmospheric pressure decreases on going above the sea level.

....

....

....

Question 2 5 marks

A Complete the following statements :

1. Troposphere contains about .... % from atmospheric envelope mass and about .... % from atmospheric water vapour.
2. The erosion of ozone layer above the .... pole increases in the month of .... every year.
3. The density of air at the top of a mountain is .... than the density of air at the sea level.
4. Increasing the mercury concentration in drinking water causes .... , while increasing arsenic concentration in it, increases the infection rate by ....

B What happens when ..... ?

Storing water in plastic bottles of mineral water.

....

....

....

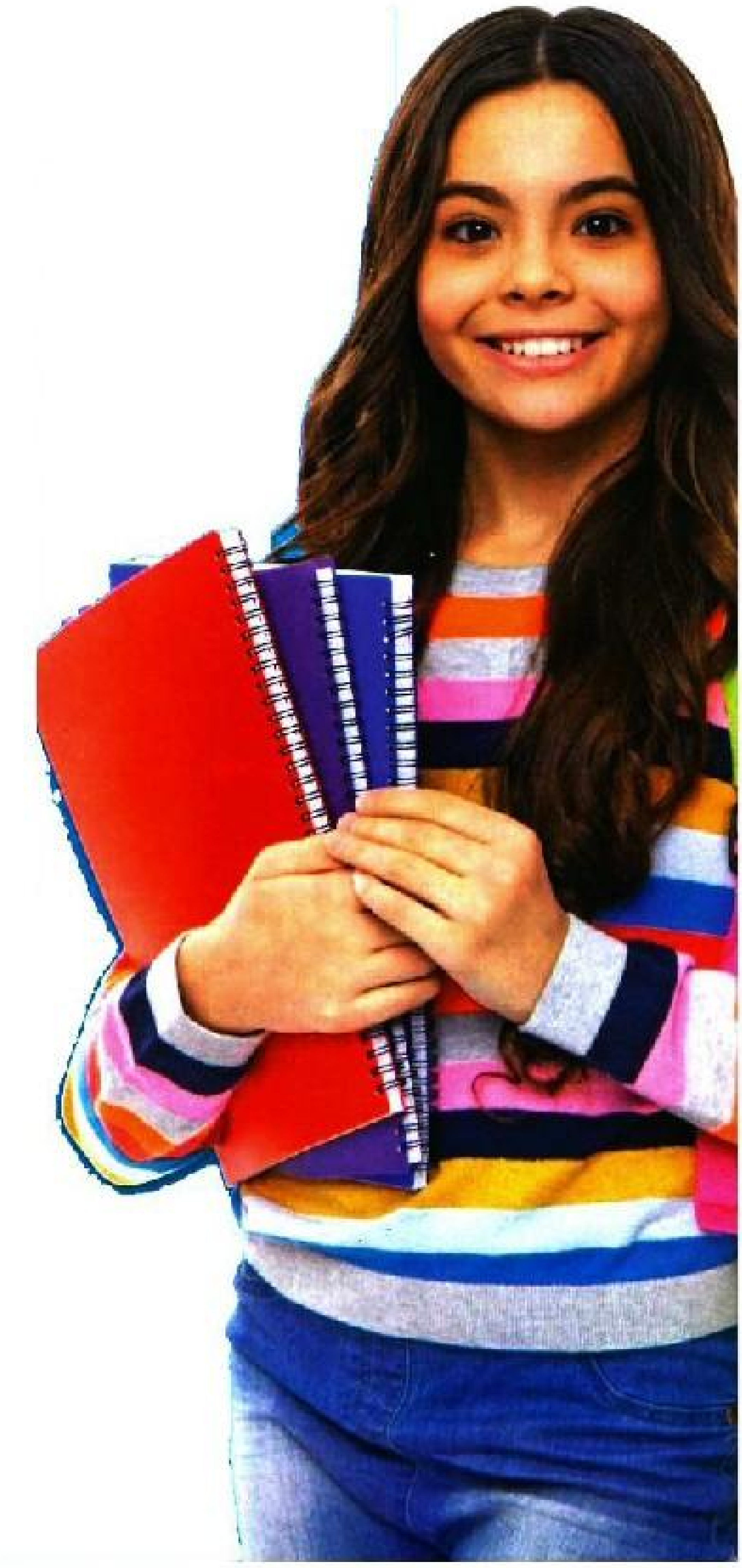
PART

2 Final Revision

UNIT 1 Periodicity of Elements and their Properties.

UNIT 2 The Atmosphere and Protecting the Planet Earth.

UNIT 3 Fossils and Protecting Species from Extinction.



Final Revision on Unit 1

1 Definitions (or scientific terms) :

1. Mendeleev's periodic table :	* It is the first real periodic table for classifying elements. * It is a table in which the elements are arranged in an ascending order according to their atomic weights.
2. Moseley's periodic table :	It is a table in which the elements are arranged in an ascending order according to their atomic numbers.
3. Modern periodic table :	It is a table in which the elements are arranged in an ascending order according to the atomic numbers and the way of filling the energy sublevels with electrons.
4. Atomic number :	It is the number of positive protons inside the nucleus of the atom of an element.
5. Picometre :	* It is the measuring unit of the atomic size of the element. * It is a part from million of the million part of a metre.
6. Electronegativity :	It is the ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.
7. Polar compounds :	They are covalent compounds in which the difference in electronegativity between their elements is relatively high.
8. Metals :	* They are the elements which have less than four electrons in their outermost energy levels. * They are the elements which tend to lose their outermost electrons and change into positive ions during the chemical reaction.
9. Positive ion :	It is an atom of a metallic element that loses one electron or more during the chemical reaction.
10. Nonmetals :	* They are the elements which have more than four electrons in their outermost energy levels. * They are the elements which tend to gain electrons and change into negative ions during the chemical reaction.
11. Negative ion :	It is an atom of a nonmetallic element that gains one electron or more during the chemical reaction.
12. Metalloids :	They are the elements which have the properties of both metals and nonmetals, like [Boron, Silicon, Germanium, Arsenic, Antimony and Tellurium].
13. Basic oxides :	They are metallic oxides, some of them dissolve in water forming alkaline solutions.

14. Acidic oxides :	They are nonmetallic oxides which dissolve in water forming acidic solutions.
15. Chemical activity series :	It is the arrangement of metals in a descending order according to the degree of their chemical activity.
16. Hydrogen bond :	It is a type of weak electrostatic attraction that arises between the molecules of some polar compounds.
17. Water pollution :	It is the addition of any substance to the water which causes continuous gradual change in water properties affecting the health and the life of living creatures.

2 Important laws and solved problems :

1 Determination of the location of elements of groups (A) in the modern periodic table.

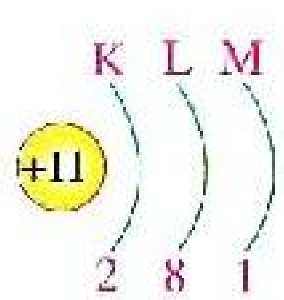
- The period number of the element = The number of energy levels occupied by electrons in its atom.
- The group number of the element = The number of electrons in the outermost energy level in its atom.

Problem

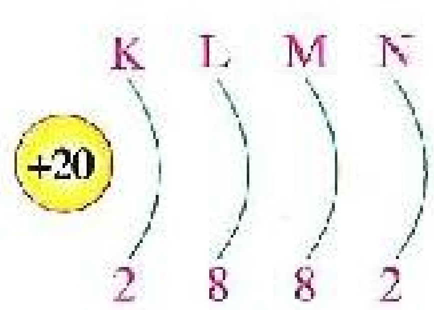
Locate the position of the following elements in the modern periodic table :

1. $_{11}Na$ **2.** $_{20}Ca$ **3.** $_{10}Ne$

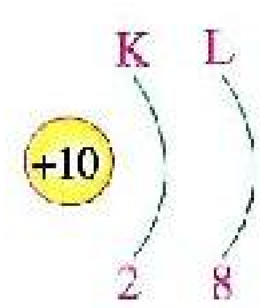
Solution

1. 

Period (3)
Group (1A)

2. 

Period (4)
Group (2A)

3. 

Period (2)
Group (0)

2 Determination of the atomic number of an element.

The atomic number of an element = The sum of the numbers of electrons rotating in energy levels "The atomic number of an element is an integer and it increases in the same period from an element to the following element by one electron".

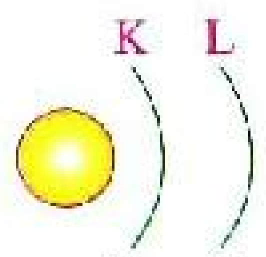
Problem

Calculate the atomic number of :

1. Element (X) which is located in period (2) and group (3A).

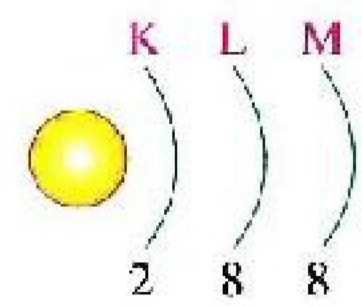
2. Element (Y) which is located in period (3) and group (0).

Solution

1. 

Atomic number of element (X)

$= 2 + 3 = 5$

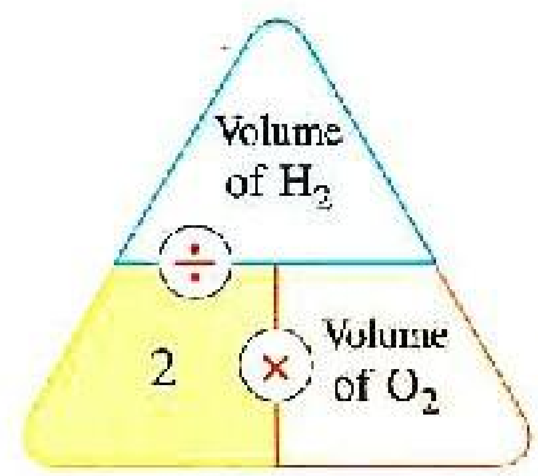
2. 

Atomic number of element (Y)

$= 2 + 8 + 8 = 18$

3 Calculation the volume of hydrogen gas or oxygen gas on electrolysis of acidified water.

The volume of hydrogen gas = 2 × The volume of oxygen gas.



Problem

Calculate the volume of hydrogen gas that evolves at the negative pole if you know that the volume of oxygen gas that evolves at the positive pole of Hofmann's voltameter is 4 cm³.

Solution

Volume of hydrogen gas = 2 × Volume of oxygen gas = $2 \times 4 = 8$ cm^3.

3 Important or uses :

Item	Importance or use
1. Liquid sodium $_{11}Na$: (Metal)	It is used in transferring heat from inside the nuclear reactor to outside to be used to obtain the vapour energy required to generate electricity.
2. Radioactive cobalt 60 : (Transition element)	It is used in food preservation.

3. Silicon $_{14}Si$: (Metalloid)	Silicon slides are used in the manufacture of electronics such as computer.
4. Liquefied nitrogen $_{7}N$: (Nonmetal)	It is used in preservation of cornea of the eye.
5. Hofmann's voltameter :	It is used in electrolysis of water to its elements.
6. Water :	It is very important for survival of all living organisms and it has several uses in : • Agricultural fields. • Industrial fields. • Personal fields.

4 Scientists and their contributions :

1. Mendeleev :	- He arranged elements of similar properties in **vertical columns (groups)**. - He published his periodic table in his book "Principles of Chemistry" in 1871 - He classified the elements of each group into two subgroups (A and B). • ***He discovered that :*** - The elements are arranged in an ascending order according to their atomic weights on moving from the left side of the table to the right side in **horizontal rows (periods)**. - The properties of elements were **repeated periodically** by the beginning of each **new period**.
2. Rutherford :	He discovered that the nucleus of the atom contains positively charged protons.
3. Moseley :	- He named the term of **atomic number** of an element on the number of positive protons in the nucleus of its atom. - He discovered after studying X-rays properties that the periodicity of the properties of elements are related to their **atomic numbers** and not to their **atomic weights**. * **The most important modifications of Moseley on Mendeleev's table :** • He arranged elements in an ascending order according to their **atomic numbers**. • He added the zero (0) group which includes inert (noble) gases to the table. • He specified a place below the table for lanthanides and actinides elements.
4. Bohr :	He discovered the main energy levels of the atom.

5 Important tables :

1 Important numbers :

1. No. of elements in Mendeleev's periodic table.	67
2. No. of main energy levels in the heaviest known atoms.	7
3. No. of elements in modern periodic table.	118
4. No. of available elements in Earth's crust.	92
5. No. of groups of modern periodic table.	18
6. No. of periods of modern periodic table.	7
7. No. of blocks of modern periodic table.	4
8. The angle between two single covalent bonds in water molecule.	104.5°
9. Boiling point of water.	100°C
10. Freezing point of water.	0°C
11. Boiling point of liquid nitrogen.	– 196°C

2 Advantages and disadvantages of Mendeleev's periodic table :

Advantages of Mendeleev's table :	1. He left gaps (empty cells) in his table predicting the discovery of new elements. 2. He corrected the atomic weights of some elements which were estimated wrongly.
Disadvantages of Mendeleev's table :	1. He had to make disorder in the arrangement in the ascending order of atomic weights of some elements to put them in groups that suit their properties. 2. He had to consider the isotopes of one element are different elements due to the difference in their atomic weights so, he had to put more than one element in one place (cell) of his table.

3 The reaction of metals with water depends on the position of the metal in chemical activity series :

Metals		Reaction with water
Potassium **Sodium**	**K** **Na**	They react instantly with water and hydrogen gas evolves which burns with a pop sound.
Calcium **Magnesium**	**Ca** **Mg**	They react very slowly with cold water.
Zinc **Iron**	**Zn** **Fe**	They react with hot water vapour at high temperature only.
Copper **Silver**	**Cu** **Ag**	They don't react with water.

4 The physical state of halogens :

Halogen :	Fluorine	Chlorine	Bromine	Iodine
Physical state :	Gas		Liquid	Solid

6 Important equations :

1. $$Mg + 2HCl \xrightarrow{\text{Dil.}} MgCl_2 + H_2\uparrow$$
   Magnesium + Hydrochloric acid → Magnesium chloride + Hydrogen gas

2. $$2Mg + O_2 \xrightarrow{\Delta} 2MgO$$
   Magnesium + Oxygen → Magnesium oxide

3. $$MgO + H_2O \longrightarrow Mg(OH)_2$$
   Magnesium oxide + Water → Magnesium hydroxide

4. $$C + HCl \xrightarrow{\text{Dil.}} \text{No reaction}$$
   Carbon + Hydrochloric acid

5. $$C + O_2 \xrightarrow{\Delta} CO_2$$
   Carbon + Oxygen → Carbon dioxide

6. $$CO_2 + H_2O \longrightarrow H_2CO_3$$
   Carbon dioxide + Water → Carbonic acid

7. $$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$$
   Sodium + Water → Sodium hydroxide + Hydrogen gas

8. $$2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$$
   Potassium + Water → Potassium hydroxide + Hydrogen gas

9. $$2K + Br_2 \longrightarrow 2KBr$$
   Potassium + Bromine → Potassium bromide

10. $$2Na + Cl_2 \longrightarrow 2NaCl$$
    Sodium + Chlorine → Sodium chloride

11. $$Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$$
    Chlorine + Potassium bromide → Potassium chloride + Bromine

12. $$Br_2 + 2KI \longrightarrow 2KBr + I_2$$
    Bromine + Potassium iodide → Potassium bromide + Iodine

13. $$2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$$
    Water → Hydrogen + Oxygen

7 Give reasons for :

1. **Many attempts are made by scientists for classification of elements.**

   To facilitate their study and find a relationship between elements and their chemical and physical properties.

2. **Mendeleev left gaps (empty cells) in his periodic table.**

   Because he predicted the discovery of new elements and determined the values of their atomic weights.

3. **Mendeleev had to make disorder in the ascending order of atomic weights of some elements.**

   To put these elements in groups that suit their properties.

4. **Mendeleev had to consider the isotopes of one element are different elements.**

   Due to the difference in their atomic weights.

5. **Mendeleev had to put more than one element in one cell.**

   Due to the similarity in their properties.

6. **Mendeleev classified the elements of each main group into two subgroups (A & B).**

   Due to the differences between the properties of their elements.

7. **Moseley arranged elements in an ascending order according to their atomic numbers.**

   Because he discovered after studying X-rays properties that the periodic properties of elements are related to their atomic numbers and not their atomic weights.

8. **Helium ($_2$He) is located in zero group and isn't located in group (2A).**

   Because it has only one energy level (K) which is saturated with 2 electrons, so it is a noble gas located in zero group (group 18).

9. • **Elements of the same group have similar properties.**

   • **Properties of elements ($_{12}$Mg) and ($_{20}$Ca) are similar.**

   Because their atoms have the same number of electrons (two electrons) in the outermost energy level.

10. **Both sodium ($_{11}$Na) and potassium ($_{19}$K) are located in the same group.**

    Because their atoms have the same number of electrons (one electron) in the outermost energy level.

11. **Both lithium ($_3$Li) and nitrogen ($_7$N) are located in the same period.**

    Because their atoms have the same number of energy levels (2 levels) occupied by electrons.

12. **Scientists cannot discover a new element between sulphur ($_{16}$S) and chlorine ($_{17}$Cl).**

    Because the atomic number of each element is an integer and it increases than its preceding one in the same period by one.

13. In the same period, the atomic size decreases by increasing the atomic number.

Because the attraction force between the positive nucleus and the outermost electrons increases through the period by increasing the atomic number (by going from left to right).

14. By increasing the atomic number within the same group, the atomic size increases from top to bottom.

Due to the increase of the number of energy levels through the group by increasing the atomic number (on going from up to down).

15. Water and ammonia are polar covalent compounds.

Because the difference in electronegativity between the elements forming their molecules is relatively high.

16. Water is more polar than ammonia.

Because the difference in electronegativity between oxygen and hydrogen in water molecule is greater than that between nitrogen and hydrogen in ammonia molecule.

17. Sodium ($_{11}Na$) atom tends to form a positive ion, while chlorine ($_{17}Cl$) atom tends to form a negative ion.

Because sodium atom loses the outermost electron forming positive ion, while chlorine atom gains an electron forming negative ion.

18. Both sodium ion (Na^+) and fluoride ion (F^-) have the same number of electrons.

Because during chemical reactions, sodium atom ($_{11}Na$) loses one electron and fluorine atom ($_9F$) gains one electron so, the number of electrons becomes 10 electrons in both ions.

19. The metallic property for elements of group (1A) increases by increasing the atomic number.

Due to increasing their atomic sizes, so they can lose their valency electron easily.

20. • Cesium (Cs) is the most metallic element.

• Cesium (Cs) is the most active metal in the periodic table.

Because it has the largest atomic size, so it can lose its valency electron easily.

21. We can use dilute HCl to differentiate between carbon and magnesium.

Because magnesium is a metal which reacts with dilute HCl and hydrogen gas evolves, while carbon is a nonmetal which doesn't react with HCl.

$Mg + 2HCl \xrightarrow{Dil.} MgCl_2 + H_2\uparrow$

22. Solution of magnesium oxide turns the violet litmus solution into blue.

Because magnesium oxide dissolves in water forming magnesium hydroxide (alkaline solution) which turns litmus solution into blue.

$MgO + H_2O \longrightarrow Mg(OH)_2$

23. We can use water to differentiate between calcium and zinc.

Because calcium can react with cold water, while zinc reacts with hot water vapour at high temperature only.

24. Nonmetal oxides are known as acidic oxides.

Because they dissolve in water forming acidic solutions.

25. Solution of carbon dioxide turns the violet litmus solution into red.

Because it dissolves in water forming carbonic acid which turns litmus solution into red.

$CO_2 + H_2O \longrightarrow H_2CO_3$

26. Aluminium oxide is considered as an amphoteric oxide.

Because it reacts with acids as a basic oxide and it reacts with bases as an acidic oxide giving salt and water in the two cases.

27. Elements of group (1A) are known as alkali metals.

Because they react with water forming alkaline solutions.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

28. Lithium floats on water surface, while cesium sinks in water.

Because the density of lithium is less than that of water, while the density of cesium is greater than that of water.

29. Alkali metals are monovalent elements.

Because they tend to lose the valency electron during the chemical reaction.

30. Sodium is kept under the surface of kerosene.

To prevent it from the reaction with moist air as it is an active metal.

31. Lithium ($_3Li$) is the least active metal in group (1A).

Because it has the least atomic size in group (1A).

32. Sodium fires are not put off with water.

Because sodium reacts instantly with water and hydrogen gas evolves which burns with a pop sound.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

33. Potassium is more active than sodium.

Because the atomic size of potassium is larger than that of sodium.

34. The reaction of potassium with water is more strongly than that of sodium.

Because potassium is more active than sodium.

35. Elements of group (7A) are known as halogens.

Because they react with metals forming salts.

$2K + Br_2 \longrightarrow 2KBr$

36. Halogens are monovalent.

Because they tend to gain one electron only during the chemical reaction.

37. • **Halogens exist in the form of diatomic molecules.**

• **Halogens do not exist in nature in elementary state.**

Because they are chemically active elements.

38. Bromine can't replace chlorine in its salt solution.

Because bromine is less active than chlorine.

39. Liquid sodium is used in nuclear reactors.

Because it is a good conductor of heat, where it transfers the heat from inside the nuclear reactor to outside it to be used to obtain vapour energy required to generate electricity.

40. The use of radioactive cobalt 60 in food preservation.

Because it emits gamma rays which prevent the reproduction of microbial cells without an effect on human.

41. Silicon is used in the manufacture of electronics.

Because it is a semi-conductor, its ability to conduct electricity depends on the temperature.

42. The importance of liquefied nitrogen in the medical fields.

Because it is used in the preservation of cornea of the eye.

43. Liquefied nitrogen is used in preservation of cornea of the eye.

Due to the decrease of its boiling point (– 196°C).

44. Water has several uses.

Because it is used in agricultural fields, industrial fields and personal fields.

45. The high boiling point of water.

Due to the presence of hydrogen bonds between water molecules.

46. The presence of hydrogen bonds between water molecules.

Due to the higher electronegativity of oxygen compared with hydrogen.

47. • Water has the ability to dissolve most ionic compounds.

• Dissolving of table salt in water.

Because water is a good polar solvent.

48. Dissolving of sugar in water although it is from covalent compounds.

Because sugar molecules can make hydrogen bonds with water molecules.

49. Oil doesn't dissolve in water.

Because it is a covalent compound which can't make hydrogen bonds with water, so it doesn't dissolve in it.

50. Ice floats on the water surface.

Because the density of ice is less than the density of water.

51. Although water of oceans freezes at polar zones, the aquatic creatures are still alive.

Due to formation of a layer of ice on the surface of liquid water protects the deep water from freezing which preserves the life of marine organisms in it.

52. The density of water in solid state (ice) is less than that its density in liquid state.

Because when the temperature of water becomes less than 4°C, water molecules are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them, so its volume increases and thus its density decreases.

53. The volume of 5 gm of ice is more than the volume of 5 gm of water at 4°C.

Because the density of ice is less than that of water at 4°C.

54. Pure water doesn't affect litmus paper dye.

Because pure water has a neutral effect on litmus paper dye.

55. On putting a glass bottle completely filled with water in a freezer, it will break.

Because when water freezes, its volume increases.

56. Adding few drops of dilute sulphuric acid to water during its electrolysis by Hofmann's voltameter.

To make water conduct to electricity, where pure water is a bad conductor of electricity.

57. The glowing of splint increases by approaching it to the anode of Hofmann's voltameter during electrolysis of acidified water.

Because oxygen gas evolves at the anode which increases the glowing of splint.

58. Biological water pollution affect the human health.

Because biological water pollution causes the infection with many diseases such as : bilharzia, typhoid and hepatitis.

59. Chemical water pollution is more dangerous than biological pollution.

Because chemical water pollution causes dangerous diseases such as the death of brain cells, blindness and liver cancer.

60. It is dangerous to eat fish containing high concentration of lead.

Because this leads to death of brain cells.

61. Thermal pollution of water leads to death of marine creatures.

Because this leads to the separation of the dissolved oxygen in water.

62. We should not keep the tap water in plastic bottles of mineral water.

Because plastic reacts with chlorine gas which is used as water disinfectant leading to the increase in the infection rates by cancer.

8 What happens when ... ?

1. Increasing the atomic number in group (1A) [concerning the atomic size].

The atomic size increases.

2. A metallic atom loses one electron or more during the chemical reaction.

It changes into a positive ion.

3. A nonmetallic atom gains one electron or more during the chemical reaction.

It changes into a negative ion.

4. We go from up to down inside the group (1A).

The atomic number increases, the atomic size increases and the metallic property increases.

5. Adding dil. HCl to a piece of magnesium.

Magnesium chloride is formed and hydrogen gas evolves as bubbles.

$$Mg + 2HCl \xrightarrow{Dil.} MgCl_2 + H_2\uparrow$$

6. Burning a magnesium strip inside a test tube contains oxygen.

It burns with a bright light and magnesium oxide powder is formed.

$2Mg + O_2 \xrightarrow{\Delta} 2MgO$

7. Adding some water to magnesium oxide with shaking.

It dissolves in water forming magnesium hydroxide.

$MgO + H_2O \longrightarrow Mg(OH)_2$

8. Adding the violet litmus solution to magnesium hydroxide.

The solution turns into blue.

9. Adding the violet litmus solution to a jar containing a piece of burning coal.

The solution turns into red.

10. Passing carbon dioxide gas in water.

It dissolves forming carbonic acid solution.

$CO_2 + H_2O \longrightarrow H_2CO_3$

11. Adding dil. HCl to a test tube containing a piece of carbon.

No reaction takes place.

12. Adding the violet litmus solution to potassium hydroxide solution.

The solution turns into blue.

13. Putting a piece of sodium in water.

It reacts strongly with water forming sodium hydroxide and hydrogen gas evolves which burns with a pop sound.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

14. Passing chlorine gas in potassium bromide solution.

Chlorine replaces bromine in its solution.

$Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$

15. Putting a piece of potassium in a beaker containing liquid bromine.

Potassium bromide salt is formed.

$2K + Br_2 \longrightarrow 2KBr$

16. Putting a glass bottle filled with water in the freezer for a long time.

It will be broken.

17. Decrease in water temperature less than 4°C

The water molecules are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them so, its volume increases and thus its density decreases.

18. Water molecules are linked together by hydrogen bonds.

The abnormality of water properties such as rising of its boiling and freezing points and decreasing its density on freezing.

19. Passing of electric current through Hofmann's voltameter containing acidified water.

The acidified water decomposes into hydrogen gas evolves at the cathode and oxygen gas evolves at the anode. The ratio between the produced hydrogen gas and oxygen gas is about (2 : 1) by volume respectively.

20. Water is polluted by animal and human wastes.

It causes biological water pollution which causes the infection by many diseases such as bilharzia, typhoid and hepatitis.

21. Storing water in plastic bottles of mineral water.

Plastic reacts with chlorine gas (which is used as water disinfectant) leading to the increase in the infection rates by cancer.

22. • Throwing synthetic cleaning substances in water.

• Dumping the atomic wastes in oceans and seas.

This leads to increase the concentration of some elements causing great harms.

23. Increasing the ratio of arsenic in drinking water.

It increases the infection rate by liver cancer.

24. Increasing the concentration of mercury in drinking water.

It causes blindness.

25. Eating fish contains high concentration of lead.

It causes the death of brain cells.

9 Comparisons :

1 Mendeleev's periodic table, Moseley's periodic table and Modern periodic table.

Mendeleev's periodic table	Moseley's periodic table	Modern periodic table
Elements are classified in an ascending order according to their atomic weights.	Elements are classified in an ascending order according to their atomic numbers.	Elements are classified in an ascending order according to : • Their atomic numbers. • The way of filling their energy sublevels with electrons.

2 Main energy levels and energy sublevels.

Points of comparison	Main energy levels	Energy sublevels
• Their number in the heaviest known atoms till now :	7	4
• They are symbolized by :	K , L, M, N, O, P and Q	s, p, d and f

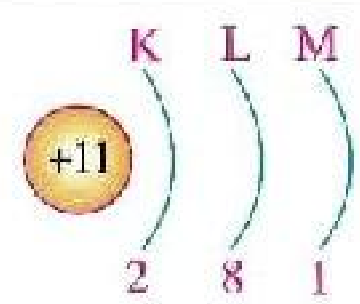
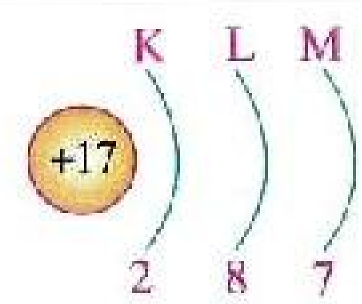
3 s-block and p-block.

Points of comparison	s-block	p-block
• Its location in the periodic table :	On the left side.	On the right side.
• It includes :	Two groups (1A) and (2A)	Six groups (3A), (4A) , (5A), (6A) , (7A) and (0)

4 d-block and f-block.

Points of comparison	d-block	f-block
• Its location in the periodic table :	In the middle	Below the periodic table.
• It includes :	Transition elements	Lanthanides and actinides.

5 Sodium ($_{11}Na$) element and chlorine ($_{17}Cl$) element.

Points of comparison	$_{11}Na$	$_{17}Cl$
• Electronic configuration of the atom :		
• Group no. :	(1A)	(7A)
• Period no. :	3	3
• Block :	s	p

6 Period elements and group elements.

Period elements	Group elements
- They are different in properties.	- They are similar in properties.
- They are similar in the number of energy levels occupied by electrons.	- They are similar in the number of electrons of the outermost energy level.
- They are different in the number of electrons of the outermost energy level.	- They are different in the number of energy levels occupied by electrons.
- By increasing their atomic numbers : • The atomic size decreases. • The metallic property decreases till we reach metalloid, then the nonmetallic property increases and ends with an inert gas.	**- By increasing their atomic numbers :** • The atomic size increases. • The metalic property increases "in groups which start with a metallic element".

7 Positive ion and negative ion.

Positive ion	Negative ion
- It is an atom of a metallic element that loses one electron or more during the chemical reaction.	- It is an atom of a nonmetallic element that gains one electron or more during the chemical reaction.
- The number of its electrons is less than that of its protons.	- The number of its electrons is more than that of its protons.
- It carries a number of positive charges equals to the number of lost electrons.	- It carries a number of negative charges equals to the number of gained electrons.
- The number of its energy levels is less than the number of energy levels in its atom.	- The number of its energy levels is equal to the number of energy levels in its atom.
- Its electronic structure is similar to that of the nearest inert gas preceding its atom in the periodic table.	- Its electronic structure is similar to that of the nearest inert gas following its atom in the periodic table.

8 Metals and nonmetals.

Metals	Nonmetals
- They are the elements which have less than four electrons in their outermost energy levels.	- They are the elements which have more than four electrons in their outermost energy levels.
- They tend to lose electrons and change into positive ions.	- They tend to gain electrons and change into negative ions.
- They are characterized by largest atomic sizes.	- They are characterized by smallest atomic sizes.
- Some of them react with dilute acids forming salt of acid and hydrogen gas.	- They don't react with dilute acids.
- They react with oxygen forming basic oxides.	- They react with oxygen forming acidic oxides.

9 Basic oxides and acidic oxides.

Basic oxides	Acidic oxides
- They are metal oxides.	- They are nonmetal oxides.
- They are formed by the reaction of metal with oxygen.	- They are formed by the reaction of nonmetal with oxygen.
- Some of them dissolve in water forming alkaline solutions.	- They dissolve in water forming acidic solutions.
- Their solutions turn litmus solution into blue. **– *Ex.* : MgO and Na_2O**	- Their solutions turn litmus solution into red. **– *Ex.* : CO_2 & SO_2**

10 Fluorine ($_9F$) and cesium ($_{55}Cs$).

Points of comparison	Fluorine ($_9F$)	Cesium ($_{55}Cs$)
• The kind of the element :	Halogen.	Alkali metal.
• Its position in the periodic table :	Period (2) and group (7A).	Period (6) and group (1A).
• Atomic size :	The smallest atomic size element in the periodic table.	The largest atomic size element in the periodic table.

11 Alkali group and halogens group.

Points of comparison	Alkali group	Halogens group
• Group no.	(1) 1A	(17) 7A
• Position :	On the maximum left side of the periodic table.	On the right side of the periodic table.
• Block belongs to it :	s-block.	p-block.
• Kind of their elements :	Metals.	Nonmetals.
• Connecting their elements to electricity and heat :	Good conductors of heat and electricity.	Bad conductors of heat and electricity.

12 Fluorine and helium.

Fluorine	Helium
- It belongs to halogens [group (17) 7A]	- It belongs to inert gases [group (18) 0]
- The outermost energy level of its atom contains 7 electrons.	- The outermost energy level of its atom contains 2 electrons.
- It is located in period (2).	- It is located in period (1).
- A halogen.	- An inert gas.
- Its molecule consists of two atoms.	- Its molecule consists of one atom.

13 Natural and artificial environmental pollutants.

Natural pollutants	Artificial pollutants
They arise from natural phenomenon such as : - Volcanic eruptions. - Death of living creatures. - Lightning accompanied by thunder storms.	They arise from different human activities such as : - Burning coal and oil which leads to the formation of acidic rains and smog. - The overuse of chemical insecticides and fertilizers. - Throwing sewage, factories wastes and leakage of petroleum oil in the seas and rivers.

14 Kinds of water pollution.

Points of comparison	Chemical pollution	Biological pollution	Radiant pollution	Thermal pollution
1. It originates from :	Discharging factories residues and sewage in seas and rivers.	Mixing animals and human wastes with water.	Dumping the atomic wastes in oceans and seas.	Increasing the temperature of some marine zones which use water for cooling the nuclear reactors.
2. Its harms :	* Blindness. * Liver cancer. * Death of brain cells.	* Bilharzia. * Typhoid. * Hepatitis.	-----------	* Death of marine creatures.

10 Activities :

Activity 1 Magnesium oxide is a basic oxide.

Steps :

1. Ignite one end of a magnesium strip until it burns, then put it in a jar filled with oxygen gas.
2. Add some drops of water with some drops of violet litmus solution to the produced substance.

Observations :

- Magnesium strip burns with a bright light and magnesium oxide is formed.
- Magnesium oxide dissolves in water.
- Litmus solution turns into blue.

Conclusion :

Magnesium oxide dissolves in water forming alkaline solution which turns litmus solution into blue.

$$MgO + H_2O \longrightarrow Mg(OH)_2$$

Activity (2) Reaction of magnesium with dilute acid.

Step :

Put a part of magnesium strip in a test tube and add some dilute hydrochloric acid (HCl).

Observation :

Evolving of gas bubbles.

Conclusion :

Magnesium reacts with dilute acid [HCl] giving magnesium chloride and hydrogen gas evolves.

$$Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$$

Activity (3) Carbon dioxide is an acidic oxide.

Steps :

1. Burn a piece of coal in a burning spoon and put it after complete burning in a cylinder full of oxygen.
2. Add some water and drops of violet litmus solution to the cylinder.

Observations :

- The glowing increases.
- Carbon dioxide dissolves in water.
- The solution turns into red.

Conclusion :

Carbon dioxide dissolves in water forming acidic solution which turns litmus solution into red.

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

Activity (4) Reaction of nonmetals [such as carbon with dilute acids.

Steps :

1. Put a piece of coal (carbon) in a test tube.
2. Add some dilute HCl to the tube.

Observation :

No reaction takes place

Conclusion :

Nonmetals [such as carbon] don't react with dilute acids.

Activity 5 Potassium is more active than sodium.

Steps :

1. Put a small piece of sodium in a beaker containing some water *Fig. (a)*.
2. Repeat the step number (1) using potassium instead of sodium *Fig. (b)*.

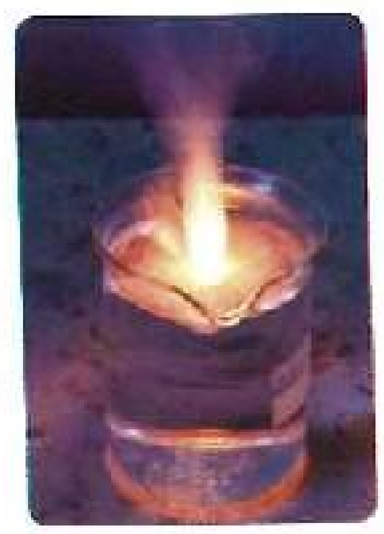


Fig. (a)



Fig. (b)

Observations :

- Both sodium and potassium react strongly with water and hydrogen gas evolves which burns with a pop sound.
- The reaction of potassium with water is more strongly than that of sodium.

Conclusion :

Potassium is more active than sodium.

Activity 6 To prove that water is a good polar solvent.

Steps :

1. Put an equal amounts of water in three glass beakers.
2. Put a spoon of sugar in the first beaker and a spoon of table salt in the second and some drops of oil in the third with stirring.

Observation :

Both sugar and table salt dissolve in water, while oil doesn't dissolve.

Conclusion :

* **Water is a good polar solvent for :**

- most ionic compounds such as table salt (sodium chloride).
- some covalent compounds such as sugar that can form hydrogen bonds with water.

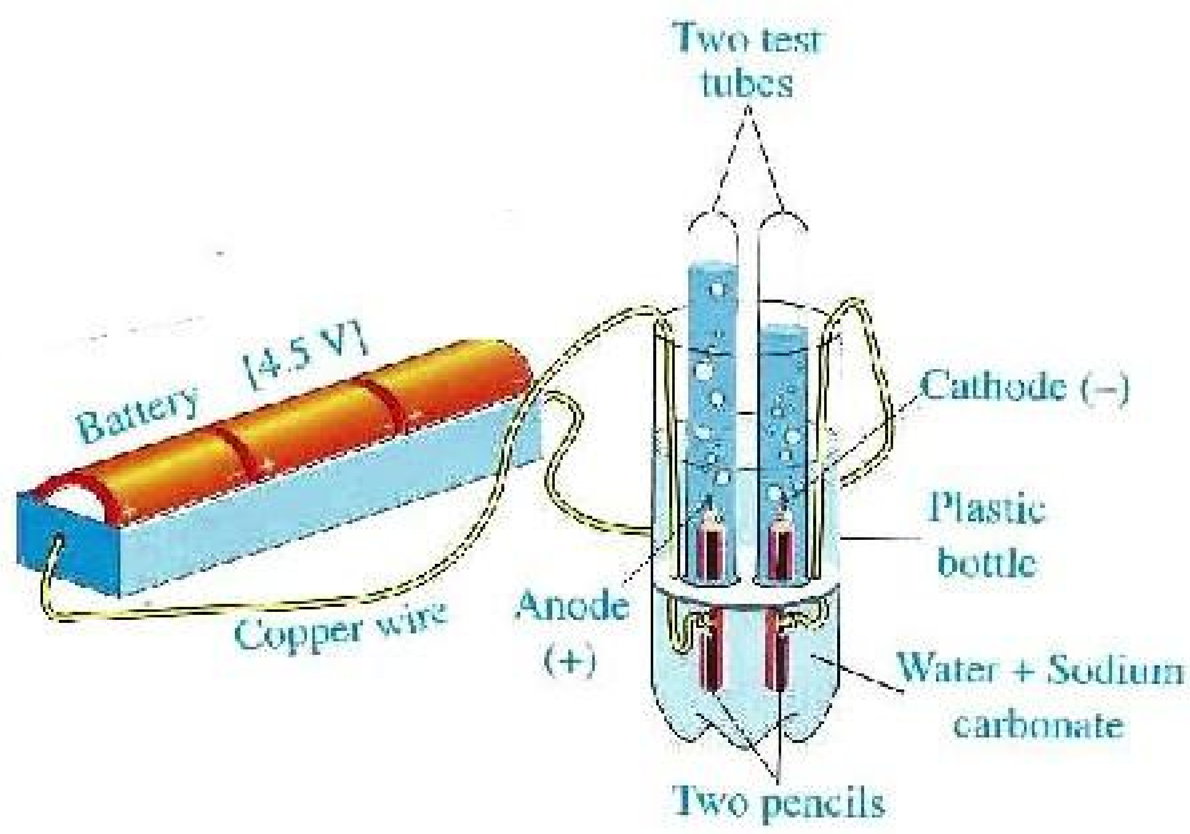
* **Most covalent compounds such as oil can't dissolve in water as they can't form hydrogen bonds with water.**

Activity 7 Electrolysis of water.

Steps :

Connect the circuit as shown in the figure, then close it for 10 min. :

1. Approach a glowing splint to the gas evolved at both cathode and anode.
2. Compare between the volume of the evolved gas above the negative pole (cathode) and the volume of the evolved gas above the positive pole (anode).



Observations :

1. The evolved gas above the cathode burns with a pop sound, while the evolved gas above the anode makes the glowing splint more glowing.
2. The volume of the evolved gas above the cathode is twice the volume of the evolved gas above the anode.

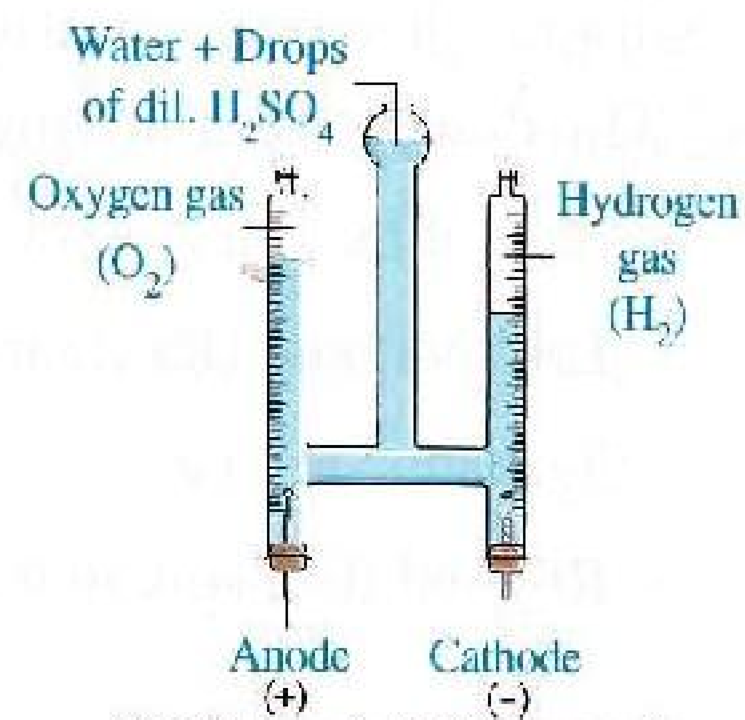
Conclusion :

The acidified water decomposes by electricity into :

- **Hydrogen gas** evolves at the **cathode**.
- **Oxygen gas** evolves at the **anode**.

- The ratio between the produced hydrogen gas and oxygen gas is about (2 : 1) by volume respectively.

$$2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$$

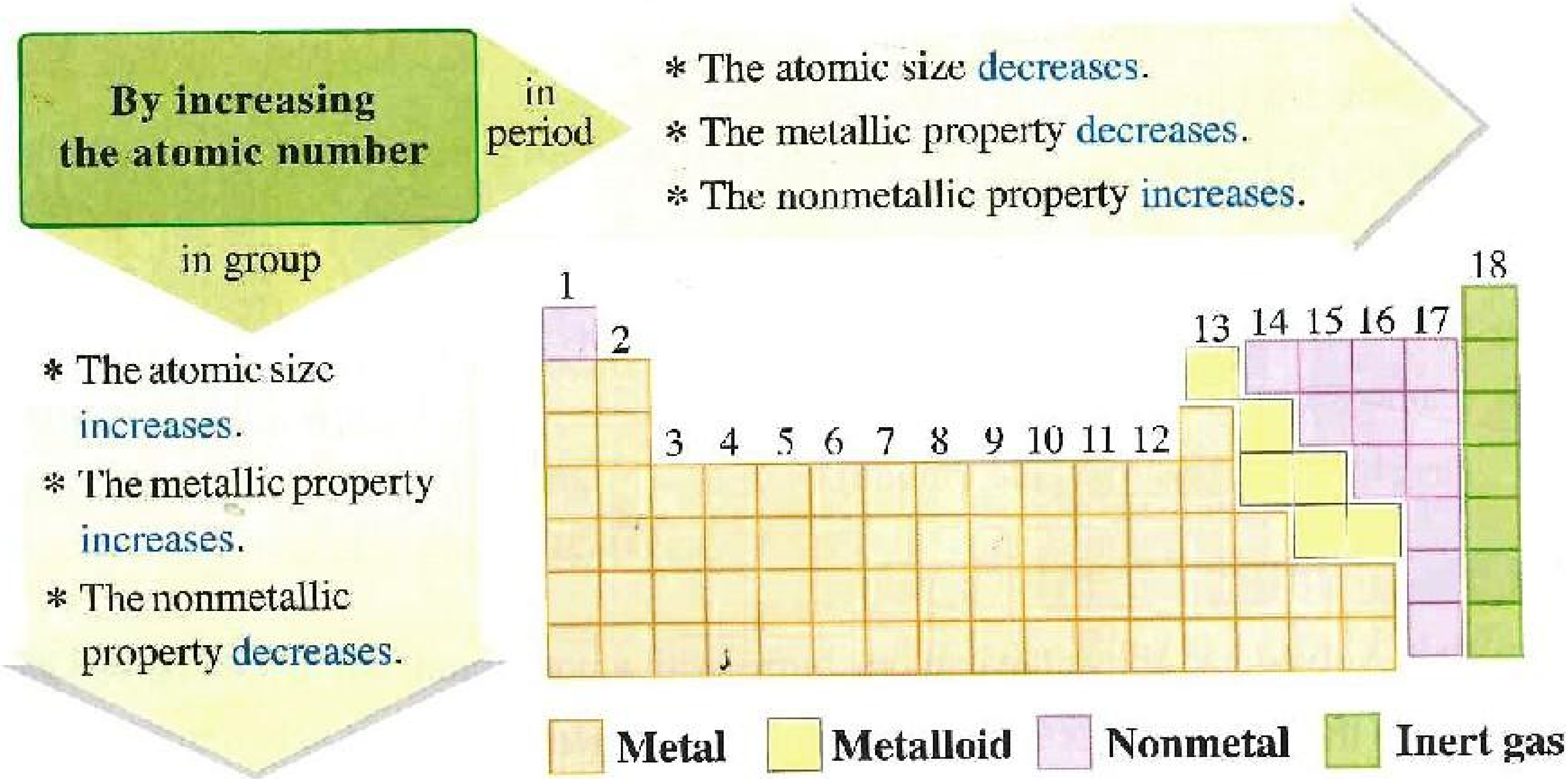


"Hofmann's Voltameter"

11 Main points :

* The atomic size is determined by knowing the atomic radius and measured in picometre.

*** Graduation of properties of elements in the modern periodic table :**



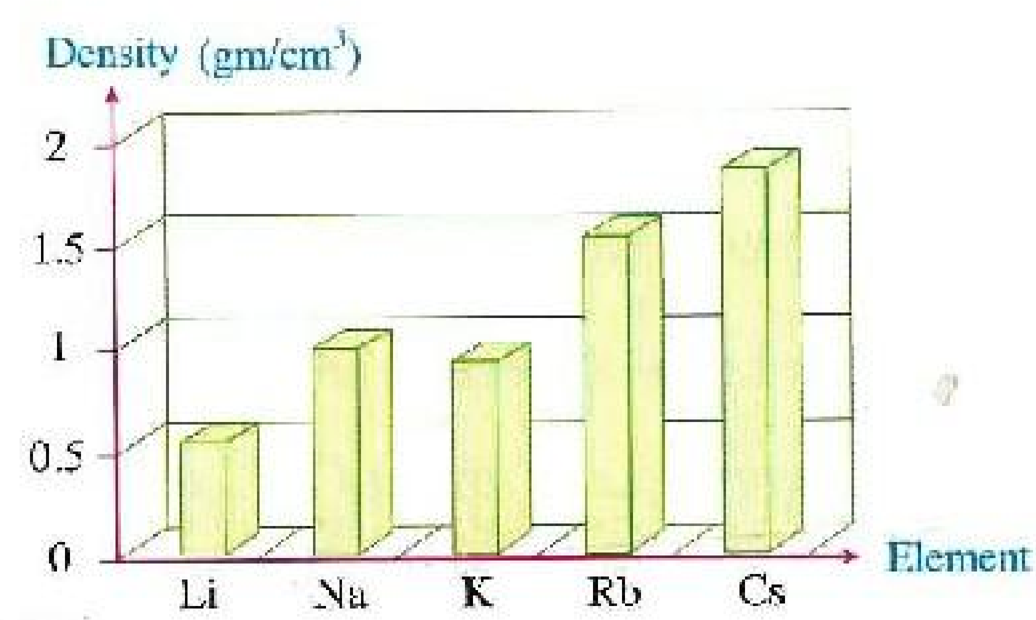
– **Cs** is the strongest metallic element in group (1A).

– **Li** is the least metallic element in group (1A).

– The most nonmetallic element is found in group (7A).

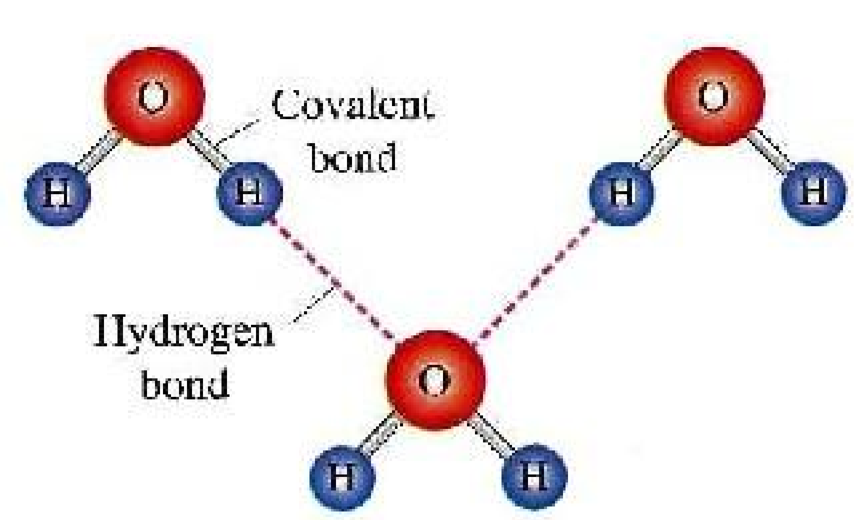
*** The density of alkali metals :**

- Most of them have low density.
- (Li), (Na) and (K) float on the water surface.
- (Rb) and (Cs) sink in water.



**** Structure of water :***

- Water molecule is formed by combination of one oxygen atom (O) with two hydrogen atoms (H) by two ***single covalent bonds***, the angle between them is 104.5°
- Due to the higher electronegativity of oxygen compared with hydrogen, polar water molecules are linked together by "***hydrogen bonds***".



*** Properties of water :**

1 Physical properties :

– Water exists in three states which are solid state (ice), liquid state (water) and gaseous state (water vapour).

– Water is a good polar solvent for most ionic compounds and some covalent compounds such as sugar.

– Pure water boils at 100°C and freezes at 0°C.

– Water density decreases on freezing.

2 Chemical properties :

– Water has a neutral effect on both of litmus papers.

– Electrolysis of water.

*** Protection of water from pollution :**

– Preventing of getting rid of sewage, wastes of factories and dead animals in rivers or canals.

– Developing the stations of water purification and doing a periodical analysis to determine the rate of water validity used in drinking.

– Disinfection of the drinking water tanks which are found on the roofs of buildings in a periodical manner.

– Don't store the tap water in empty plastic bottles, because plastic reacts with chlorine gas (which is used as water disinfectant) leading to the increase in the infection rates of cancer.

– Spreading environmental awareness among people to protect water from pollution.

Final Revision on Unit 2

1 Definitions (or scientific terms) :

Term	Definition
1. Atmospheric envelope of the Earth :	It is a gaseous envelope surrounding the Earth, that rotates with the Earth around its axis and extends for about 1000 km above sea level.
2. Atmospheric pressure :	It is the weight of air column of an atmospheric height on a unit area ($1m^2$).
3. Normal atmospheric pressure :	It is the atmospheric pressure at sea level.
4. Isobar :	Curved lines that join the points of equal pressure in atmospheric pressure maps.
5. Tropopause :	It is the region between troposphere and stratosphere layers.
6. Stratopause :	It is the region between stratosphere and mesosphere layers.
7. Mesopause :	It is the region between mesosphere and thermosphere layers.
8. Ionosphere layer :	It is a layer that contains charged ions and it exists in the upper part of thermosphere, and extends up to 700 km above sea level.
9. Van-Allen Belts :	They are two magnetic belts surrounding ionosphere.
10. Aurora phenomenon :	It is a phenomenon that appears as brightly coloured light curtains seen at both the north and south poles of the Earth.
11. Exosphere :	It is a region in which the atmospheric envelope is inserted in outer space.
12. Ozone hole :	It means thinning or losing parts of ozone layer above the south pole of the Earth.
13. Ozone molecule :	It is a gas, whose molecule consists of three oxygen atoms.
14. Dobson :	It is the measuring unit of the degree of ozone.
15. Near ultraviolet rays :	It is a type of ultraviolet rays that penetrate ozone layer by a percentage 100%.
16. Medium ultraviolet rays :	It is a type of ultraviolet rays that don't penetrate the ozone layer by a percentage 95%.
17. Far ultraviolet rays :	It is a type of ultraviolet rays that don't penetrate the ozone layer by a percentage 100%.
18. Global Warming phenomenon :	It is the continuous increase in the average temperature of the Earth's near-surface air.
19. Greenhouse effect :	It is the trapping of infrared radiation in the troposphere layer due to the increase in the percentage of greenhouse gases which cause the increase in the planet Earth's temperature.

2 Important shortcuts :

1. UV	Ultraviolet rays.
2. STP	Standard temperature and pressure.
3. CFC_s	Chlorofluorocarbon compounds.
4. IPCC	The Intergovernmental Panel on Climate Changes.

3 Important laws and solved problems :

1 The temperature changes which occur in troposphere layer.

- The temperature decreases with a rate (6.5°C) for each (1 km) height above sea level.
- The amount of change (decrease or increase) in temperature = height (km) × 6.5
- The temperature at the top of a mountain
  = the temperature at its foot – the decrease in temperature.
- The temperature at the foot of a mountain
  = the temperature at its top + the increase in temperature.
- The amount of change in temperature
  = temperature of the foot of the mountain – temperature of the top of the mountain.

Problems

1 ***Calculate the temperature at the base of a mountain, if its height is 6000 m and the temperature at its top is 10°C.***

Solution

- Height $= \frac{6000}{1000} = 6$ km.
- The amount of increase in temperature = height × 6.5°C
  = 6 × 6.5 = 39°C
- The temperature at the base of a mountain
  = the temperature at its top + the increase in temperature
  = 10 + 39 = 49°C

2 ***Calculate the height of a mountain if the temperature at its base is 30°C and at its top is (– 6°C).***

Solution

- The amount of change in temperature = temp. at the base of mountain – temp. at the top of mountain = 30 – (– 6) = 36°C

- The height of the mountain = $\frac{\text{amount of change in temp.}}{6.5}$

$= \frac{36}{6.5} = 5.5$ km.

2 The percentage of erosion of ozone layer in a certain area.

∵ The degree of erosion of ozone layer in a certain area = the normal degree of ozone layer – the degree of ozone in this area.

∴ The percentage of erosion of ozone layer in a certain area

$= \frac{\text{The degree of erosion of ozone layer}}{\text{The normal degree of ozone layer}} \times 100$

Problem

Calculate the percentage of erosion of ozone layer in an area if you know that the degree of its ozone is 150 dobson.

Solution

The degree of erosion of ozone layer in an area = 300 – 150 = 150 Dobson.

The percentage of erosion of ozone layer in this area = $\frac{150}{300} \times 100 = 50\%$

4 Important numbers and percentages :

1. The height of atmospheric envelope :	**1000 km**
2. The normal atmospheric pressure :	**1013.25 mbar**
3. The percentage of the mass of atmospheric air that is present in the area between sea level and 3 km height :	**50%**
4. The percentage of the mass of atmospheric air that is present up to 16 km height above sea level :	**90%**
5. The thickness of troposphere layer :	**13 km**

6. The percentage of the mass of atmospheric air in troposphere :	**75%**
7. The percentage of atmospheric water vapour in troposphere :	**99%**
8. The atmospheric pressure at the end of troposphere (tropopause) :	**100 mbar**
9. The temperature at the end of troposphere (tropopause) :	**– 60°C**
10. The thickness of stratosphere layer :	**37 km**
11. The atmospheric pressure at the end of stratosphere (stratopause) :	**1 mbar**
12. The temperature at the end of stratosphere (stratopause) :	**0°C**
13. The thickness of mesosphere :	**35 km**
14. The atmospheric pressure at the end of mesosphere (mesopause) :	**0.01 mbar**
15. The temperature at the end of mesosphere (mesopause) :	**– 90°C**
16. The thickness of thermosphere :	**590 km**
17. The temperature at the end of thermosphere :	**1200°C**
18. The atmospheric pressure of thermosphere :	**0.001 mbar**
19. The thickness of ozone layer :	**20 km**
20. The height in which the presence of charged ions ends in ionosphere :	**700 km**
21. Number of oxygen atoms in ozone molecule :	**3**
22. The thickness of ozone layer at (STP) conditions :	**3 mm**
23. Normal degree of ozone :	**300 Dobson**
24. The wavelength of near ultraviolet rays :	**315 – 400 nm**
25. The wavelength of medium ultraviolet rays :	**280 – 315 nm**
26. The wavelength of far ultraviolet rays :	**100 – 280 nm**
27. The percentage of near UV radiations that penetrate ozone layer :	**100%**
28. The percentage of medium UV radiations that don't penetrate ozone layer (Or the percentage of medium UV radiations that are absorbed by ozone layer) :	**95%**
29. The percentage of far UV radiations that don't penetrate ozone layer (Or the percentage of far UV radiations that are absorbed by ozone layer) :	**100%**
30. Nanometre :	**1×10^{-9} metre**

5 Importance or uses :

Item	Importance or uses
1. Barometer :	It is used to measure the atmospheric pressure.
2. Altimeter :	It is used by pilots in aeroplanes to measure the elevation from sea level based on atmospheric pressure.
3. Aneroid :	It is used to determine the possible day weather based on atmospheric pressure.
4. Isobar :	To join the points of equal pressure in atmospheric pressure maps.
5. Atmospheric pressure maps :	They are used to detect the directions of winds, as winds move from the areas of high atmospheric pressure to the areas of low atmospheric pressure.
6. Troposphere :	- In which, all weather phenomena take place. - It organizes the Earth's temperature.
7. Ozone layer :	It acts as a protective shield for living organisms against the harmful chemical effects of ultraviolet radiations.
8. Mesosphere :	It protects the planet Earth from celestial rocky masses that enter the atmospheric envelope, where some of them burn completely forming meteors.
9. Ionosphere :	It is important in wireless communications and broadcasting.
10. Van-Allen Belts :	They play an important role in scattering harmful charged cosmic radiations away from the Earth.
11. Exosphere :	In which, satellites orbit around the Earth.
12. Satellites :	They transmit weather condition information and TV programs.
13. Chlorofluorocarbon compounds (CFC_S) [Freons] :	They are used as : • A cooling substance in air conditioning sets. • A propellant substance in aerosols. • A flating substance in making foam backing. • A solvent substance for cleaning electric circuits boards.
14. Methyl bromide gas :	It is used as an insecticide to preserve stored agricultural crops.
15. Halons :	They are used in extinguishing fires.

6 What is the role of ... ?

1. Ultraviolet radiation in the formation of ozone gas :	Oxygen gas molecule absorbs ultraviolet radiation (UV) which causes the break down of its double covalent bond giving two free oxygen atoms, then each oxygen atom combines with an oxygen molecule forming ozone molecule. $O_2 \xrightarrow{UV} O + O$ $O + O_2 \longrightarrow O_3$
2. CO_2 in global warming phenomenon :	Increase of CO_2 in air causes trapping of infrared radiation in troposphere layer, which leads to the increase in the temperature of the planet Earth.
3. Infrared radiation in global warming :	Infrared radiation has a thermal effect, so when trapped in the troposphere layer this leads to increasing the planet Earth's temperature.

7 Give reasons for :

1. **The atmospheric pressure decreases on going above sea level.**
   Due to decreasing the length of air column and thus its weight decreases.
2. **The atmospheric pressure differs from an area to another on the Earth's surface.**
   Due to the difference in the length of air column from an area to another on the Earth's surface.
3. **Altimeter instrument is important for navigation.**
   Because it is used by pilots in aeroplanes to determine their elevations above sea level.
4. **Winds blowing from a region to another on the Earth's surface.**
   Due to the difference in atmospheric pressure from a region to another on the Earth's surface, where the wind moves from regions of high atmospheric pressure to that of low atmospheric pressure.
5. **The troposphere layer is called by this name.**
   Because all atmospheric turbulences take place in it.
6. **The temperature at the top of a mountain is less than that at its foot.**
   Because in troposphere layer, the temperature decreases as we go up by a rate (6.5°C) for each 1 km height.
7. **Rains, clouds and winds are present in troposphere layer.**
   Because it contains about 75% of the mass of atmospheric envelope.
8. **Troposphere layer regulates the Earth's temperature.**
   Because it contains 99% of atmospheric water vapour.

9. The air motion in troposphere layer is vertical.

Because the hot air currents (less density) move upwards, while cold air currents (high density) move downwards.

10. The stratosphere layer is called the ozonic atmospheric envelope.

Because it contains most of ozone gas (O_3) which is found in atmospheric envelope.

11. Temperature is high in the upper part of stratosphere layer.

This is due to the absorption of ultraviolet rays (emitted from the Sun) by ozone layer, which is present at its upper part.

12. • The lower part of stratosphere is suitable for flying aeroplanes.

• Pilots prefer to fly their aeroplanes in stratosphere.

Because in this part, the air motion is horizontally and neither clouds nor weather turbulences exist.

13. Mesosphere layer is called by this name.

Because it is the middle layer.

14. Mesosphere is the coldest layer.

Because the temperature in such layer decreases with a high rate as we go up until it reaches (–90°C) at its top.

15. Mesosphere layer is highly rarefied.

Because it contains a limited amount of helium and hydrogen gases only.

16. Luminous meteors are formed in mesosphere layer.

Due to burning of some celestial rocky masses that enter the atmospheric envelope of Earth through mesosphere as a result of their friction with air molecules.

17. The last layer of atmospheric envelope is called thermal layer.

Because it is the hottest layer in atmospheric envelope.

18. The upper part of thermosphere layer is called ionosphere.

Because it contains charged ions.

19. Ionosphere is important for radio stations.

Because it reflects radio waves transmitted by radio stations and communication centres.

20. Van-Allen Belts play an important role in protecting the Earth.

Because they scatter the harmful charged cosmic radiations away from the Earth.

21. Occurrence of aurora phenomenon.

Due to scattering of harmful charged cosmic radiations away from the Earth by Van-Allen Belts.

22. Formation of ozone layer in the stratosphere layer.

Because stratosphere layer is the first layer in the atmospheric envelope which contains suitable amount of oxygen gas, faces ultraviolet radiations emitted from the Sun.

23. The ozone layer acts as a protective shield for living organisms.

Because it doesn't allow penetration of all far and most of medium ultraviolet radiations which have harmful chemical effects and threaten the life of living organisms.

24. Increasing the size of ozone hole in September every year.

Due to increasing the amount of pollutants which are emitted at this time every year.

25. Chlorofluorocarbon compounds are dangerous to the environment.

Because they cause erosion of ozone layer and global warming phenomenon.

26. Factories should stop their production of foam boxes.

To reduce the use of chlorofluorocarbon compounds as they are used in making foam backing.

27. Scientists decrease using freon as a cooling material.

Because freon causes erosion of ozone layer and global warming phenomenon.

28. Stop producing concorde aeroplanes.

Because their exhausts contain nitrogen oxides that causes erosion of the ozone layer.

29. Increasing the average temperature of the Earth's near-surface air during the last years.

Due to increasing of greenhouse gases in the atmosphere.

30. Increasing in CO_2 gas percentage in the atmosphere.

Due to fossil fuel burning, cutting trees and forests fires.

31. Infrared radiation cannot penetrate the Earth's atmosphere.

Because it has a long wavelength.

32. Naming global warming phenomenon by greenhouse effect.

Because the Earth's atmosphere resembles the role of glass in greenhouse as it prevents penetration of infrared radiation causing increasing of the Earth's temperature.

33. The global warming phenomenon has negative effects on Earth.

Because it causes melting of the snow of both south and north poles and also it causes severe climatic changes.

34. Most countries are attempting to reduce the use of fossil fuel.

To prevent increasing the percentage of CO_2 gas which increases the temperature of the planet Earth.

8 What happens when ... ?

1. **Diving into the depths of the sea [concerning the atmospheric pressure].**
   The atmospheric pressure increases.
2. **Ascending upwards in troposphere [concerning the temperature and the atmospheric pressure].**
   The temperature decreases with a rate 6.5°C for each 1 km height and the atmospheric pressure decreases.
3. **Descending downwards in stratosphere [concerning the temperature and the atmospheric pressure].**
   The temperature decreases and the atmospheric pressure increases.
4. **Friction of space rocky masses with air molecules in mesosphere.**
   They burn forming meteors.
5. **Harmful cosmic radiations collide with the ionosphere.**
   The cosmic radiations are scattered which lead to the occurrence of Aurora phenomenon.
6. **Ultraviolet radiation hits oxygen molecule.**
   The bond between oxygen molecule is broken down giving two free oxygen atoms (2O).
7. **Oxygen atom combines with oxygen molecule.**
   Ozone molecule is formed.
8. **Existence of ozone in conditions of standard temperature and pressure (STP).**
   The thickness of ozone layer will be 3 mm only.
9. **Overuse of methyl bromide gas as an insecticide.**
   Erosion of ozone layer increases.
10. **Increasing in the percentage of nitrogen oxides in the atmospheric envelope.**
    Erosion of ozone layer increases.
11. **Overuse of freon.**
    Erosion of ozone layer increases and also the temperature of the Earth increases.
12. **Erosion of ozone layer over an area.**
    Medium and far UV rays penetrate ozone layer and cause harmful effects.
13. **Increasing in the percentage of greenhouse gases in the atmosphere.**
    Increasing the temperature of near-surface air of planet Earth.
14. **Infrared radiations don't reemit back from troposphere layer.**
    Occurrence of greenhouse effect phenomenon which causes the increase in the planet Earth's temperature.

15. Melting the snow of south and north poles.

The level of seas and oceans would increase and therefore :

- Disappearance of the coastal areas.
- Extinction of some polar animals like the polar bear and seals.

16. Earth's temperature increases [Concerning : the climatic changes].

Tropical hurricanes, destructive floods, drought waves and forests fires take place.

17. The continuous increase in consumption of fossil fuel.

The percentage of CO_2 gas increases in the atmospheric air by a continuous way which leads to occurrence of greenhouse effect phenomenon.

9 Comparisons :

1 Layers of atmospheric envelope :

Points of comparison	Troposphere layer	Stratosphere layer	Mesosphere layer	Thermosphere layer
• Thickness :	13 km.	37 km.	35 km.	590 km.
• Temperature :	– 60°C at its top.	0°C at its top.	– 90°C at its top.	1200°C at its top.
• Atmospheric pressure :	100 mbar at its top.	1 mbar at its top.	0.01 mbar at its top.	0.001 mbar.
• It contains :	- 75% of the mass of the atmospheric air. - 99% of atmospheric water vapour.	Most of ozone gas which is found in atmospheric envelope.	A limited amount of helium and hydrogen gases only.	Charged ions in its upper part.
• Air movement :	Vertically.	Horizontally.		

2 Ionosphere layer and exosphere layer :

P.O.C.	Ionosphere layer	Exosphere
• Definition :	It is a layer that contains charged ions and it exists in the upper part of thermosphere and extends up to 700 km above sea level.	It is a region in which the atmospheric envelope is inserted in outer space.
• Importance :	It is very important in wireless communications and broadcasting.	In which, satellites orbit around the Earth.

3 Near ultraviolet rays and far ultraviolet rays :

Points of comparison	Near ultraviolet rays	Far ultraviolet rays
• The ratio of its penetration into the Earth's surface :	100 %	0 %
• Wavelength :	315 – 400 nm	100 – 280 nm
• Their effects on living organisms :	Useful	Harmful

4 Greenhouse effect and ozone hole :

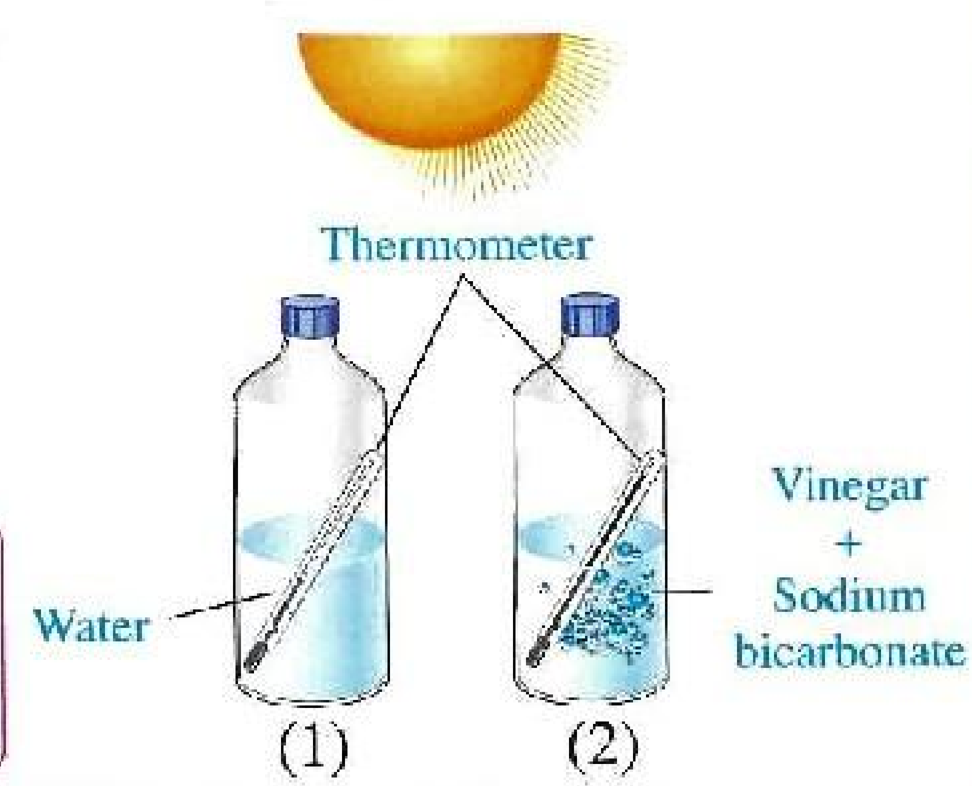
Points of comparison	Greenhouse effect	Ozone hole
• Causes :	Increasing the percentage of greenhouse gases in the atmosphere such as : • Nitrous oxide gas (N_2O). • Water vapour (H_2O). • CO_2 gas • CFC_S • Methane (CH_4).	The atmosphere contains compounds that pollute the ozone layer such as : • CFC_S • Methyl bromide gas. • Halons. • Nitrogen oxides gases.
• Harms :	Increasing the Earth's temperature causing global warming phenomenon.	Penetration of harmful ultraviolet rays to the Earth's surface which threaten the life of living organisms.

10 Activity :

Activity To know the greenhouse effect.

Tools :

- 2 empty soda bottles.
- 2 thermometers.
- Sodium bicarbonate powder.
- Water.
- Vinegar.



Note CO_2 gas is produced from the reaction between sodium bicarbonate and vinegar.

Steps :

1. Pour some water in bottle (1) and the same amount of vinegar in bottle (2).
2. Insert a thermometer in each bottle.
3. Close bottle (1) and put some sodium bicarbonate powder in bottle (2) and close it immediately to keep CO_2 gas trapped.
4. Put both bottles in sunny place for 10 minutes.

Observations :

- Evolving of gas bubbles in bottle (2).
- Higher reading of the thermometer in bottle (2).

Conclusion :

The increase in the concentration of CO_2 gas leads to the increase in the temperature.

*** Similarly :***

- The temperature of planet Earth has been increasing since 1935 due to increasing the greenhouse gases [especially CO_2].

11 Important drawings :

1 Aneroid instrument



2 Altimeter instrument

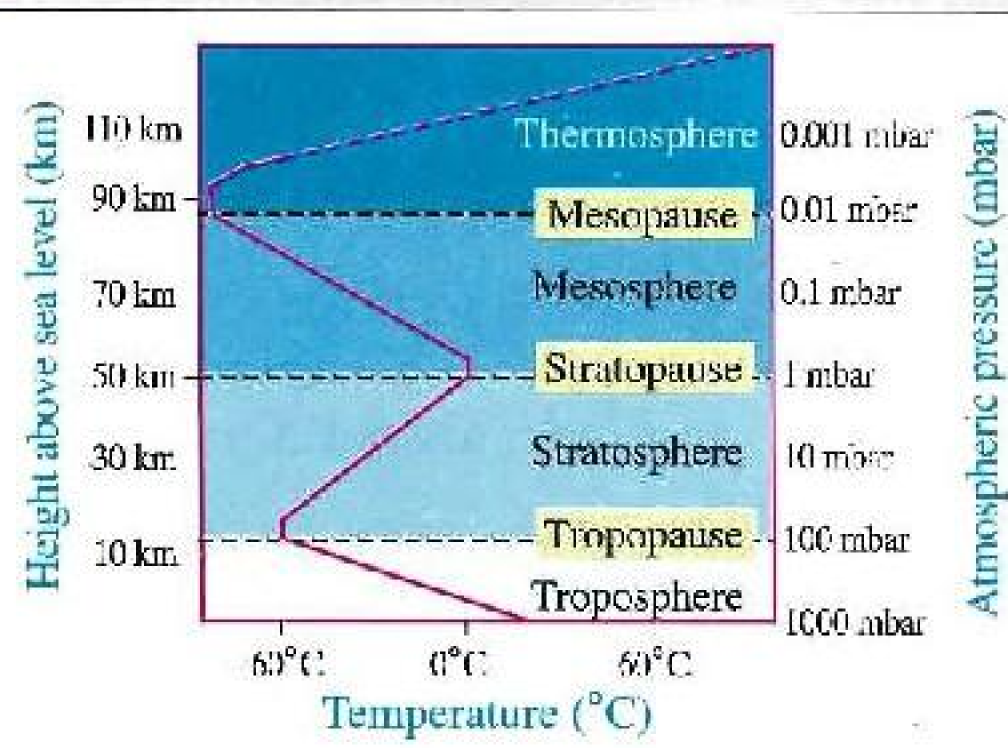


Analog Altimeter



Digital Altimeter

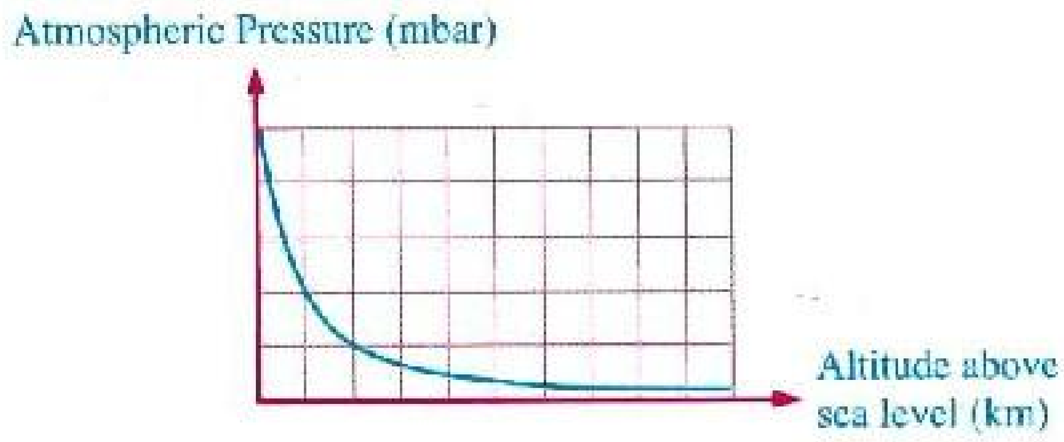
3 Layers of atmosphere



4 Van-Allen Belts



5 The atmospheric pressure changes by changing the height above sea level



The relation between the altitude above sea level and the pressure [Inverse relationship]

12 Main points :

– The atmospheric pressure is measured in a unit called **a bar** or **millibar**.

1 bar (b) = 1000 millibar (mbar).

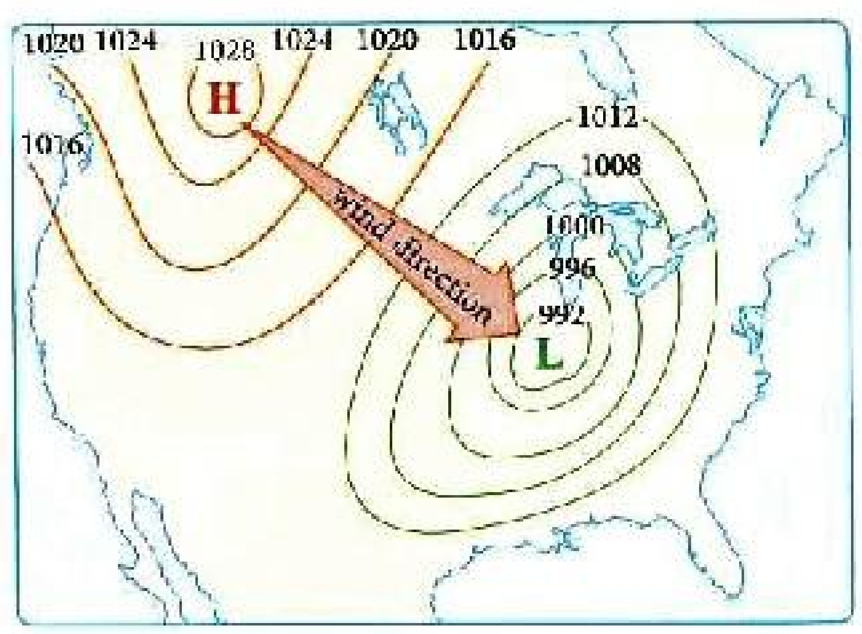
– The normal atmospheric pressure = 1013.25 mbar.

– The atmospheric pressure increases by increasing the length of air column and vice versa.

– The density of air decreases on going above sea level.

– In atmospheric maps :

- The areas of low atmospheric pressure are represented by "L".
- The areas of high atmospheric pressure are represented by "H".



– The wind moves from the areas of high atmospheric pressure to the areas of low atmospheric pressure.

– The atmospheric envelope consists of four layers above sea level which are classified according to :

- The change in atmospheric pressure.
- The change in temperature.

*** Formation of ozone gas :**

1. Oxygen gas molecule (O_2) absorbs ultraviolet (UV) radiation, which causes the break down of the bond between the two oxygen atoms giving two free oxygen atoms (2O). $O_2 \xrightarrow{UV} O + O$

2. Each oxygen atom combines with an oxygen molecule forming ozone molecule (O_3) which is composed of three oxygen atoms.

$$O + O_2 \longrightarrow O_3$$

*** Pollutants of ozone layer :**

1. Chlorofluorocarbon compounds.
2. Methyl bromide gas.
3. Halons.
4. Nitrogen oxides.

*** The most important greenhouse gases :**

1. Carbon dioxide gas (CO_2).
2. Chlorofluorocarbon compounds (CFC_s).
3. Methane gas (CH_4).
4. Nitrous oxide (N_2O).
5. Water vapour (H_2O).

*** Interpretation of the greenhouse phenomenon :**

When the concentration of greenhouse gases increases in the atmosphere, the atmosphere plays the role of glass in the greenhouse as :

1. It permits the visible light and short-waved rays produced from the Sun to pass.
2. The Earth and its components absorb these rays and reemit the radiation back in the form of infrared radiation.
3. When the rate of greenhouse gases increases in troposphere, the infrared radiation cannot penetrate the atmosphere, because it has a long wavelength.
   So, it is kept trapped in the troposphere causing the rise of planet Earth temperature (Greenhouse effect).

* **The ultraviolet radiation** has a chemical effect, while **infrared radiation** has a thermal effect.

*** The negative effects of global warming phenomenon :**

(1) Melting the snow of both south and north poles :

Melting of polar ice would increase the level of seas and oceans, which leads to :

1. Disappearance of the coastal areas.
2. Extinction of some polar animals like the polar bear and seals.

(2) Severe climatic changes :

Among these features is the repeated occurrence of :

1. Tropical hurricanes such as hurricane Katrina in 2005.
2. Destructive floods.
3. Drought waves.
4. Forests fires.

Final Revision on Unit 3

1 Definitions (or scientific terms) :

1. Fossils :	They are traces and remains of old living organisms that are preserved in sedimentary rocks.
2. Trace :	It is the traces of an old living organism that indicate its activity during its life.
3. Remains :	They are the traces that indicate the remains of an old living organism after death.
4. A complete body fossil :	It is a fossil that keeps the whole shape and all the details of the body of the living organism as a result of its rapid burying as soon as it died in a medium that preserves it from decomposition.
5. Amber :	It is the solidified resinous matter which was secreted by pine trees in old geologic ages.
6. Solid mold fossil :	It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks.
7. Cast fossil :	It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks.
8. Petrified fossils :	They are fossils in which minerals replace the organic matter of an old living organism, after its death, part by part leaving the shape without any change.
9. Petrification :	It is the process of conversion of the parts of old living organisms to rocky materials as a result of replacing the organic material of the organism with minerals, part by part.
10. Petrified woods :	They are fossils which are formed as a result of replacing the wood material of trees with minerals such as silica, part by part, giving us details about the life of an old plant.
11. Index fossils :	They are fossils of organisms that had lived for a short period of time in the past and had a wide geographical range distribution, then became extinct.
12. Fossil record :	The sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.
13. Extinction :	• It is the continuous decrease without compensation in the number of a certain species of living organisms until all members of species die out. • It is dying out of all members of species of living organisms.
14. Food chain :	It is a path of energy that transfers from a living organism to another in the ecosystem.

15. Food web :	It is a group of food chains connected with each other.
16. Simple ecosystem :	It is an ecosystem that has a few members and it is strongly affected by the absence of one of its species.
17. Complicated ecosystem :	It is an ecosystem that has multiple members and it is not affected much by the absence of one of its species.
18. Natural protectorates :	They are safe areas established to protect endangered species in their homeland.

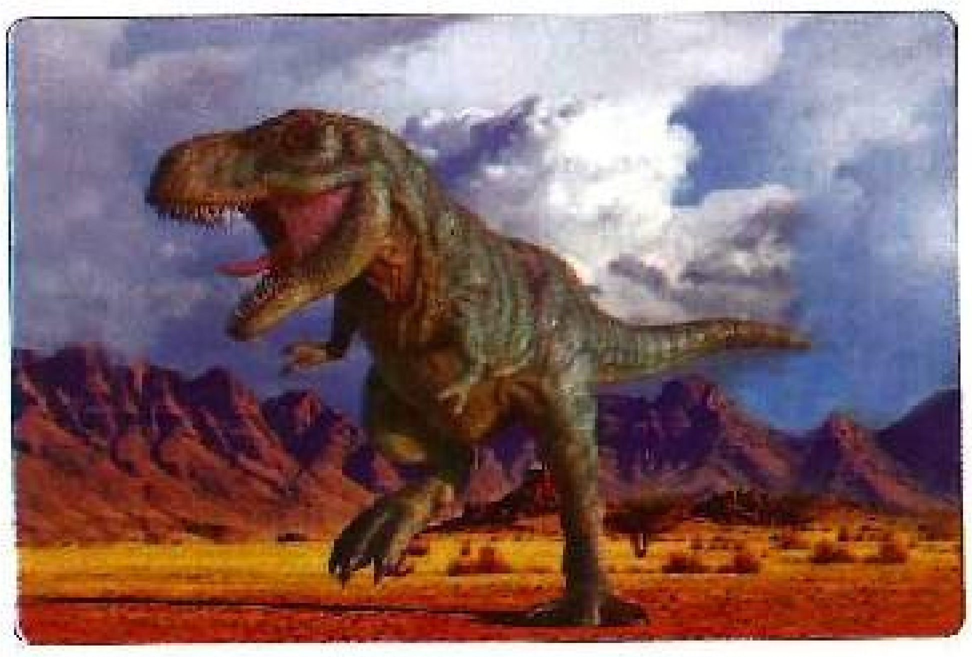
2 Importance (or the role of) :

Item	Importance (or the role of)
1. Fossils :	• Age determination of sedimentary rocks. • Figuring out the paleoenvironment. • Studying life evolution. • Petroleum exploration.
2. Index fossils :	They indicate the age of sedimentary rocks existed in them.
3. Nummulites fossils :	They indicate that El-Mokattam mountain was a sea floor more than 35 million years ago.
4. Coral fossils :	They indicate that the environment where they lived was clear warm shallow seas.
5. Ferns fossils :	They indicate that the environment where they lived was a hot and rainy tropical environment.
6. Fossil record :	It indicates the sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.
7. Microfossils (foraminifera and radiolaria) :	They indicate that : • The age of rocks existed in exploratory wells. • The suitable conditions of petroleum formation.
8. Natural protectorate :	It protects endangered species in their homeland.
9. Papyrus plant :	Pharaohs used it to manufacture writing papers.
10. Yellowstone protectorate :	It protects grey bear from extinction.
11. Panda protectorate :	It protects panda bear from extinction.
12. Ras Mohamed protectorate :	It protects rare species of coral reefs and coloured fish from extinction.
13. Wadi El-Hetan in Wadi El-Raiyan protectorate :	It contains complete whales' skeleton fossils (40 million years ago).

3 Important tables :

1 Extinct species in the old times :

1 Dinosaur :



Dinosaur became extinct from millions of years ago.

2 Mammoth :



Mammoth is called the grandfather of recent elephant.

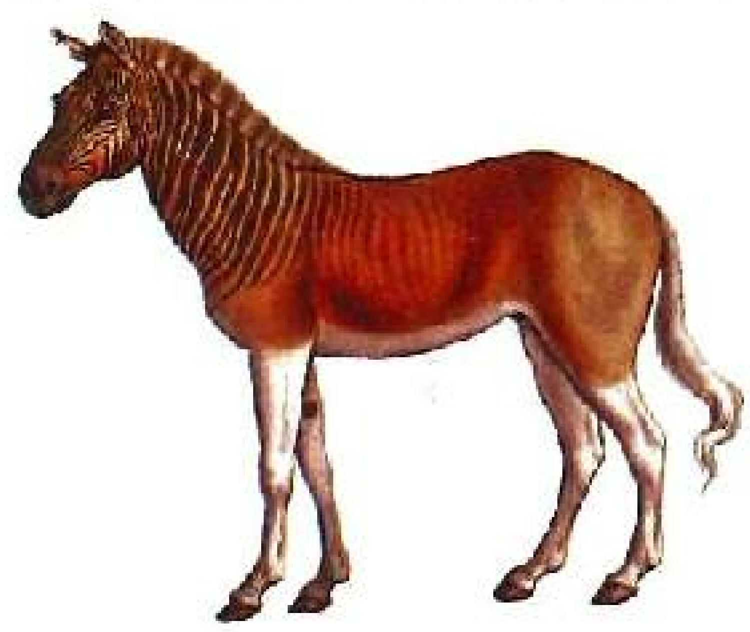
2 Extinct species in the recent times :

1 Dodo bird :



It is a non-flying bird due to the reduced size of its wings.

2 Quagga :



- It is a mammal animal.
- It is considered the midway between horse and zebra.

3 Endangered species :

1 Panda bear :



2 Rhinoceros :



3 Ibis bird :



4 Barbary sheep (Arui) :



5 Papyrus plant :



It is used by pharaohs to manufacture writing papers.

6 Bald eagle :



It is called bald because its head is covered with white feathers which make it looks like bald.

4 The important world's protectorates :

Protectorate	Location	Protected kinds
1. Yellowstone protectorate :	USA	Grey bear 
2. Panda protectorate :	Northeastern China.	Panda bear 

5 Egypt's important protectorates :

Protectorate	Location	Protected kinds
1. Ras Mohamed protectorate : The first established protectorate in Egypt in 1983.	South Sinai governorate.	Rare species of coral reefs and coloured fish 
2. Wadi El-Hetan (part of Wadi El-Raiyan protectorate) :	El-Fayoum governorate.	Complete whales'skeleton fossils (40 million years ago). 

4 Give reasons for :

1. Mammoth fossil is preserved as a complete body fossil.
Because when it died, it was rapidly buried in snow which preserved it from decomposition.

2. Amber is considered as a suitable medium for the formation of complete body fossils.
Because it preserved the bodies of insects inside it from decomposition.

3. Ammonites fossil is classified as a mold fossil.
Because it is a replica of the internal details of the snail of ammonites.

4. Formation of petrified woods fossils.
Due to replacing the organic matter of wood by minerals part by part.

5. Naming the petrified forest with wood mountain.
Because it contains petrified woods which look like rocks.

6. The petrified woods are considered from fossils although they look like rocks.
Because they give us the details about the life of an old plant.

7. El-Mokattam mountain was a part of a sea floor more than 35 million years ago.
Due to the presence of nummulites fossils in the limestone rocks of El-Mokattam mountain.

8. Nummulites fossils are considered as index fossils.

Because they indicate the age of sedimentary rocks, as the age of rocks is the same age of fossils existed in them.

9. Not all known fossils are considered as index fossils.

Because the index fossils are the fossils of living organisms that lived for a short period of time in the past and had a wide geographic distribution, then became extinct and these conditions are not available in all fossils.

10. Fossils are important in petroleum exploration.

Because the presence of foraminifera and radiolaria in the rocks of the exploratory wells indicate the suitable conditions of petroleum formation.

11. • Occurrence of macro extinctions for many living organisms.

• Extinction of dinosaurs.

Due to : - Meteorite impacts with Earth.
- The violent Earth movement.
- Exposure of the Earth to long ice age.
- Toxic (poisonous) gases which evolved from volcanoes.

12. Occurrence of recent extinction.

Due to : - Destroying natural habitat. - Overhunting.
- Environmental pollution. - Climatic changes and natural disasters.

13. Dodo bird was an easy target for hunters.

Due to the reduced size of its wings, so it is a non-flying bird.

14. Naming the bald eagle by this name.

Because its head is covered with white feathers which make it looks like bald.

15. • The simple ecosystem is significantly affected by the absence of one of its species.

• Desert ecosystem is significantly affected by the absence of one of its species.

Due to the rarity of alternative that compensates the absence of this species.

16. Tropical forest is a complicated ecosystem.

Because it is a system containing a large number of members of living organisms and it is not affected by the absence of any species.

17. • It is important to reproduce the endangered species and send them back to their native habitats.

• Scientists attempt to establish a gene bank for some types of living organisms.

To protect the rare and endangered living organisms from extinction.

18. Some governments are interested in establishing natural protectorate areas.

To protect endangered living organisms in their homeland.

19. Yellowstone is an important natural protectorate.
Because it protects grey bear from the danger of extinction.

20. World organizations are interested in studying the environment of Ras Mohamed protectorate.
Because it contains rare species of coral reefs and coloured fish.

21. Wadi El-Hetan is considered the most important area in Wadi El-Raiyan protectorate.
Because it contains complete whales'skeleton fossils (40 million years ago).

5 What are the consequences of each of the following ... ?

1. An organism is buried fast after death in snow.
A complete body fossil of it is formed.

2. Dipping the old insects in amber.
The bodies of insects are preserved inside it from decomposition.

3. The solidification of the mineral sediments inside a snail, then the decomposition of its shell over millions of years.
A solid mold fossil for snail is formed which carries the internal details of its structure.

4. Putting a clam's shell on the surface of a flat piece of clay and pressing it gently.
A cast of shell is formed carrying the external details of its shell.

5. Minerals replace wood material part by part of an old tree.
It changes into petrified wood.

6. Extinction of a species from a balanced ecosystem.
It causes a cavity in the path of energy in this ecosystem that would disturb the ecosystem equilibrium or destroy it.

7. The absence of one type of species from the simple ecosystem.
It is strongly affected due to the rarity of alternative that compensates this absence.

6 Comparisons :

1 Mammoth fossil and amber fossil :

Mammoth fossil	Amber fossil
Burying of mammoth after death immediately in snow which preserved it from decomposition.	Immersing insects in resinous matter (which was secreted by pine trees) that solidified and preserved the bodies of these insects inside it from decomposition.

2 Trace and remains :

Trace	Remains
It is the traces indicate the activity of an old living organism during its life. ***Ex. :*** Traces of worm's tunnels.	They are the traces indicate the remains of an old living organsim after death. ***Ex. :*** Remains of dinosaur's skull.

3 Mold and cast :

Mold	Cast
It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks. ***Ex. :*** Trilobite fossil.	It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks. ***Ex. :*** Fish cast.

4 Mold and trace :

Mold	Trace
It is the replica of the internal details of the structure of an old living organism leaving them in the sedimentary rocks after death. ***Ex. :*** Nummulites fossil.	It is the traces that indicate an activity of an old living organism leaving them in sedimentary rocks during its life. ***Ex. :*** Dinosaur's foot print.

5 Cast and trace :

Cast	Trace
It is the replica of the external details of the structure of an old living organism leaving them in sedimentary rocks after death. ***Ex. :*** Cast of ferns.	It is the traces that indicate an activity of an old living organism leaving them in sedimentary rocks during its life. ***Ex. :*** Worms' tunnels.

6 Coral fossils and ferns fossils :

Coral fossils	Ferns fossils
They indicate that the environment where they lived was clear warm shallow seas.	They indicate that the environment where they lived was a hot and rainy tropical environment.

7 Nummulites fossil and foraminifera fossil :

Nummulites fossil	Foraminifera fossil
It indicates that the area of El-Mokattam mountain was a sea floor more than 35 million years ago.	It indicates that : - The age of rocks existed in exploratory wells. - The suitable conditions of petroleum formation.

8 Simple and complicated ecosystems :

Simple ecosystem	Complicated ecosystem
- It is characterized by containing a few number of members of living organisms (few members).	- It is characterized by containing a large number of members of living organisms (multiple members).
- It is strongly affected by the absence of one of its species, because of the rarity of alternative that compensates this absence.	- It is not affected much by the absence of one of its species, because it has many alternatives.
***Ex.* :** Desert.	***Ex.* :** Tropical forest.

7 Important figures :

1 Examples of traces :

Worm's tunnels



Dinosaur's foot print



2 Examples of remains :

Remains of a dinosaur's skull



Remains of shark's teeth



3 Examples of solid mold fossils :

Ammonites fossil



Nummulites fossil

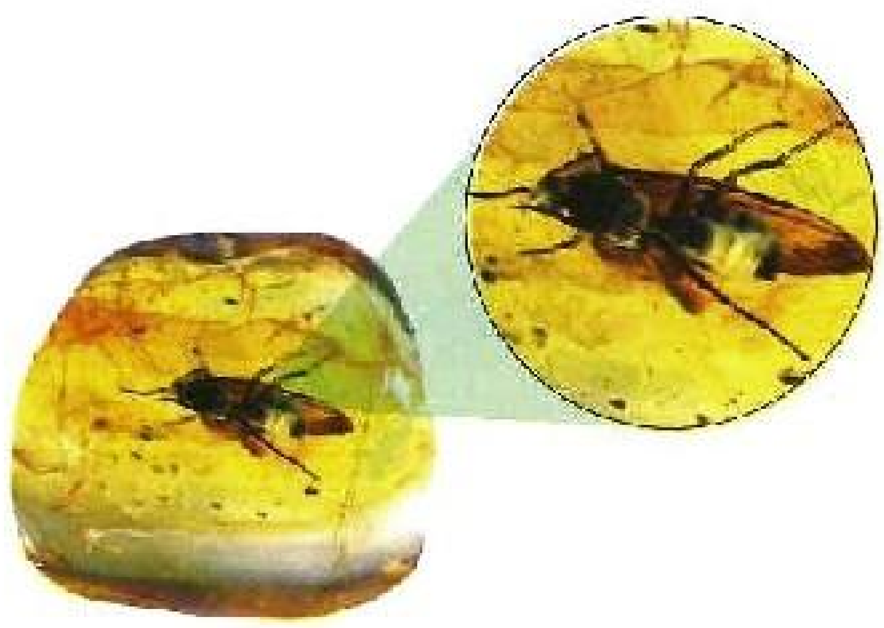


Trilobite fossil



4 Examples of complete body fossils :

Amber fossil

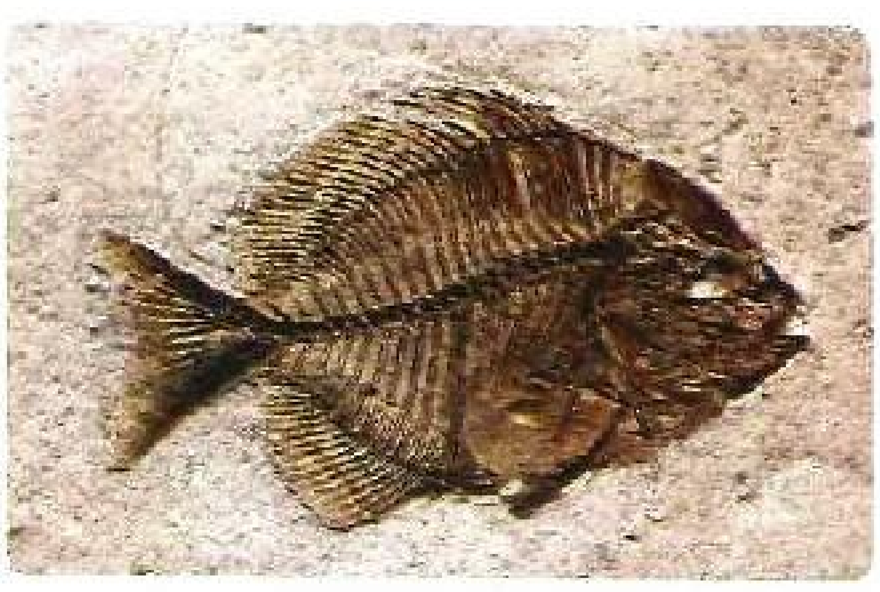


Mammoth fossil

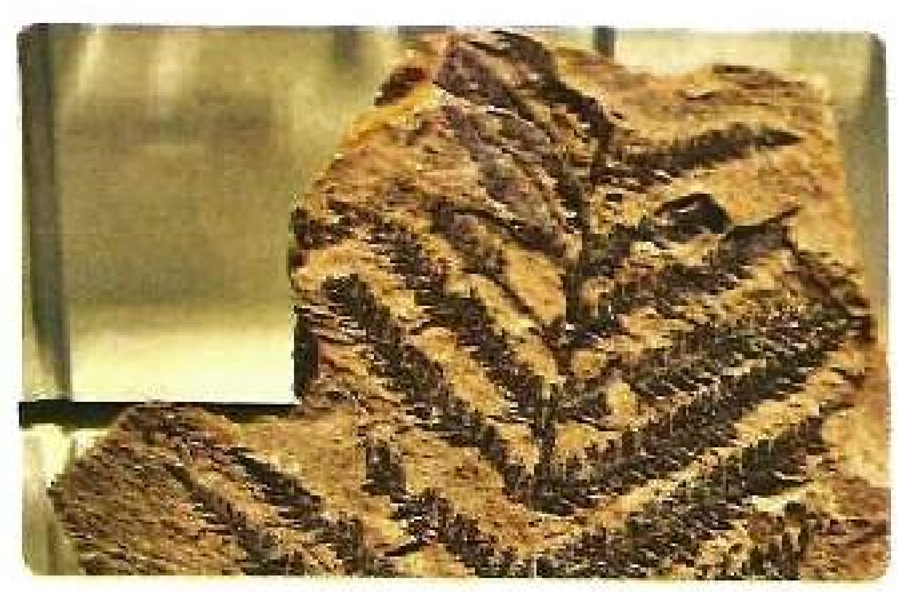


5 Examples of cast fossils :

Fish cast



Cast of ferns



6 Examples of petrified fossils :

Petrified wood

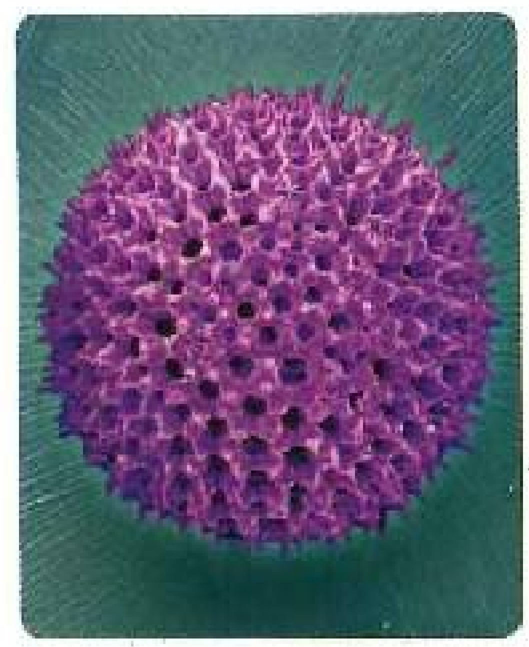


Petrified dinosaur's eggs



Petrified dinosaur's tooth



7 Coral fossil :	8 Archaeopteryx fossil :
	
9 Radiolaria :	10 Foraminifera :
	

8 Main points :

*** How is the solid mold fossil formed ?**

- When a snail (or clam) dies, it falls on the sea floor, where its soft parts decomposed leaving the shell which is buried in sediments.
- The sediments fill up the shell cavities and solidify as the time passes.
- The shell decomposes completely, leaving a solid rock mold carrying the internal details of the snail.

*** Suitable conditions for fossils formation (or preservation) :**

1. Presence of hard skeleton of organism.
2. The body of the organism must be buried immediately after death in a medium that preserves it from decomposition.
3. The existence of a suitable medium in which the mineral of rocks replaces the organic material of the living organism.

*** Studying the fossil record showed that :**

1. Life started first in sea then established on land.
2. Organisms developed from simple to complicated as :
   - Algae appeared before mosses and ferns.
   - Gymnosperms appeared before angiosperms.

- Invertebrates (such as corals and mollusks with shells) appeared before vertebrates.
- Fish were the first vertebrates that appeared, followed by amphibians, then reptiles, and finally birds and mammals appeared together.

* **Archaeopteryx fossil** is considered a link between reptiles and birds.

* **Reasons of extinction :**

A. Reasons of extinction in old ages [macro extinctions] :

Many scientists attributed macro extinctions of some living organisms (like extinction of dinosaurs) due to occurrence of :

1. Meteorite impacts with Earth.
2. The violent Earth movement.
3. Exposure of the Earth to long ice age.
4. Toxic (poisonous) gases which evolved from volcanoes.

B. Reasons of extinction in recent ages :

Recent extinction occurred now is caused by different factors.
Most of them are due to the interference of man with nature such as :

1. Destroying natural habitat.
2. Overhunting.
3. Environmental pollution.
4. Climatic changes and natural disasters.

* **Examples of some extinct species in old times :**

- Dinosaur.
- Mammoth.

* **Examples of some extinct species in the recent times :**

- Dodo bird [It is a non-flying bird].
- Quagga [It is considered the midway between horse and zebra].

* **Examples of endangered species :**

- Panda bear.
- Rhinoceros.
- Bald eagle.
- Ibis bird.
- Papyrus plant.
- Barbary sheep.

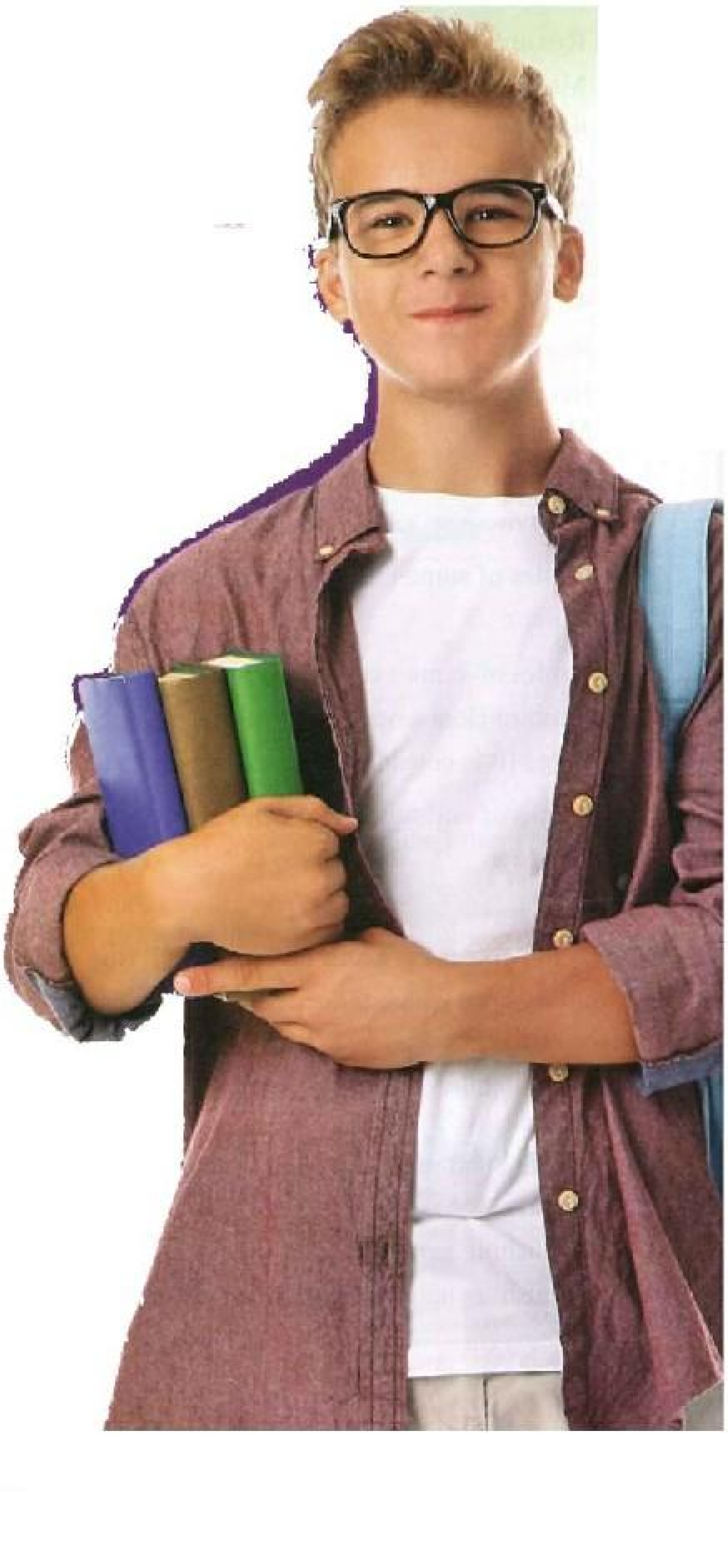
* **Ways to protect rare and endangered living organisms from extinction :**

1. Putting laws which regulate the process of hunting of living organisms especially the rare types.
2. Increasing the awareness about the importance of natural life to sustain the existence of mankind.
3. Breeding and reproducing the endangered species and sending them back to their native habitats.
4. Establishing gene banks for the endangered species.
5. Establishing natural protectorate areas.

PART 3

Final Examinations

Final Examinations of Some Governorates



Final Examinations 2024

of Some Governorates

1 Cairo Governorate — Heliopolis Educational Zone

Answer the following questions :

Question 1

A Choose the correct answer :

1. The number of known elements till now is ....
   a. 92 elements. b. 118 elements. c. 67 elements. d. 26 elements.
2. The region in which satellites float in it is ....
   a. mesopause. b. ionosphere. c. mesosphere. d. exosphere.
3. All of the following are from acidic oxides except ....
   a. SO_2 b. CO_2 c. NO_2 d. Na_2O
4. .... is considered the first protectorate in Egypt to protect coral reefs.
   a. Panda b. Ras Mohamed c. Wadi El-Raiyan d. Yellowstone

B Write the scientific term of each of the following :

1. The ability of atom in the covalent molecule to attract electrons towards itself.
2. The molecule that is formed as a result of combination between element atom with molecule of the same element.
3. The periodic table in which elements arranged according to their atomic weights.

C If you know that the volume of hydrogen gas that is evolved at cathode during electrolysis of water is 24 cm^3, find the volume of oxygen gas that is evolved at anode.

Question 2

A Complete the following sentences :

1. The element $_{12}Mg$ locates in period .... and group ....
2. From examples of complete body fossils is .... and .... is from examples of petrified fossils.
3. .... is the coldest layer in the atmosphere but .... is the hottest layer.
4. Increasing the concentration of .... causes blindness but increasing the concentration of .... causes death of brain cells.

B Choose the odd word out and write the scientific name for the rest :

1. Boron – Neon – Silicon – Germanium.

2. Carbon dioxide – Methane – Oxygen – Water vapour.
3. Sodium – Bromine – Chlorine – Fluorine.

C Compare between mold fossil and cast fossil.

Question 3

A Correct the underlined words :

1. Pilots prefer to fly their planes in the lower part of **thermosphere**.
2. **Lithium** is the most active metal.
3. **Silicon** is used in preservation of cornea of the eye.
4. From the old reasons for extinction is **the severe climatic change**.

B Arrange the following :

1. Potassium (19) – Fluorine (9) – Lithium (3) – Calcium (20). (from biggest to smallest atomic size)
2. Stratosphere – Thermosphere – Troposphere – Mesosphere. (from furthest to nearest)
3. Iodine – Chlorine – Bromine – Fluorine. (from strongest to weakest)

C Give a reason for dissolving sugar in water although it is a covalent molecule.

Question 4

A Put (✓) or (✗) of each of the following, then correct the wrong ones :

1. The scientist Bohr discovered that the positive protons inside nucleus. ( )
2. The aneroid is used to determine the possible day weather by knowing the atmospheric pressure. ( )
3. The coral fossils indicate that the environment was hot and rainy. ( )
4. It is prefer to use concorde airplanes as they protect the ozone layer. ( )

B Mention an example of the following :

1. A polar compound. 2. A microfossil.
3. A measuring unit of atmospheric pressure.

C What happens when ...?
A member disappears in the simple ecosystem. (mention the reason)

2 Cairo Governorate — El-Nozha Educational Zone

Answer the following questions :

Question 1

A Choose the correct answer :

1. .... is the replica of internal details of old living organisms.
   a. Fern cast b. Ammonites c. Fish cast d. Amber

2. Ozone layer is found in .... layer.

a. troposphere b. stratosphere c. mesosphere d. thermosphere

3. Increasing the concentration of .... causes blindness.

a. lead b. arsenic c. mercury d. chlorine

4. The elements which occupy the middle block(d) in the periodic table are called .... elements.

a. alkali b. noble c. transition d. alkaline Earth

B Choose the odd word out for the following :

1. Silver – Sodium – Iron – Calcium.
2. CO_2 – MgO – Na_2O – CaO
3. Nitrogen oxides – Water vapour – Freon – Halons.

C Write the scientific term for the following :

The ability of the atom in the covalent molecule to attract the electrons of the chemical bond to itself.

Question 2

A Correct the underlined words :

1. Petrified woods are replaced by **sand**.
2. Water electrolysis produces **hydrogen gas only**.
3. **Rutherford** was the founder of the first periodic table.
4. The **thermosphere** layer is much vacuumed layer.

B Complete the sentences by using words between brackets :

(Ammonia – Infrared – Troposphere – Alkali metals – Halogens – Ultraviolet)

1. .... radiation is characterized by thermal effect.
2. .... have 7 electron in the outermost energy level.
3. .... is a polar compound that has four atoms.

C Give a reason for the following : Dodo bird was an easy target for hunters.

Question 3

A Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Radiant pollution	a. making foam boxes.
2. Freon is used in	b. is due to the atomic wastes.
3. Biological pollution	c. is due to mixing human with animals wastes.
	d. they are used in extinguishing fire.

B Rearrange the following :

1. Zinc – Calcium – Silver – Sodium. (ascendingly according to chemical activity).
2. Stratopause – Tropopause – Mesopause. (from the sea level).
3. Fish – Mammals – Reptiles. (according to first appearance on life stage).

C Find the volume of the gas which is evolved at the anode during the electrolysis of water, if the volume of the other gas is 20 cm^3.

Question 4

A Put (✓) or (✗) in front of the following :

1. Tropical forest is an example of simple ecosystem. ( )
2. Water electrolysis takes place by barometer. ( )
3. Satellites orbit in ionosphere. ( )
4. Both oil and sugar are covalent compounds. ( )

B Write the function of :

1. Van-Allen belts.
2. Sedimentary rocks to fossils.
3. Hofmann's voltameter.

C Locate the position of the element in the modern periodic table : $_{18}Ar$

3 Cairo Governorate

Manart Al-Salam School

Answer the following questions :

Question 1

A Write the scientific term for the following :

1. The ability of an atom in the covalent compound to attract the bonded electrons.
2. Addition of any substance to water that causes continuous gradual change in water properties.
3. Charged layer reflects radio waves.
4. Traces and remains of old living organisms that are preserved in the sedimentary rocks.

B Correct the underlined words :

1. **Fluorine** is the only liquid halogen.
2. Transition elements lie in **s-block**.
3. The measuring unit of the degree of ozone layer is **bar**.

C Determine :

The position and type of ($_{19}K$) in the modern periodic table.

Question 2

A Choose the correct answer :

1. The largest atomic size group is ....

   a. 2A b. 1A c. zero d. 7A

2. The normal atmospheric pressure at the sea level equals .... millibar.

   a. 1013.25 b. 76 c. 1.013 d. 37

3. Complete fossils of insects are found preserved in ....

   a. ammonites. b. igneous rocks. c. amber. d. ambergris.

4. .... replaces .... in solutions of its salts.

   a. Chlorine – bromine b. Bromine – fluorine
   c. Iodine – chlorine d. Iodine – fluorine

B Choose the odd word out :

1. $CO_2 - O_2 - N_2O - CH_4$
2. $K_2O - Na_2O - Al_2O_3 - MgO$
3. Helium – Chlorine – Argon – Neon.

C What happens when ...? The continuous decrease in the number of a certain species.

Question 3

A Put (✓) or (✗) :

1. The air moves horizontally in the lower part of stratosphere. ( )
2. Ferns fossils indicate that they lived in mild environment. ( )
3. Water and ammonia are non-polar compounds. ( )
4. Ice crystals have pentagonal shapes. ( )

B Complete the following chemical equations :

1. $.............. + ... \xrightarrow{\Delta} CO_2$
2. $Mg + 2HCl \xrightarrow{dil.} .... + ...$
3. $2H_2O \xrightarrow{Electrolysis} .... + ...$

C Compare between :

The basic of the classification of elements according to Mendeleev and Moseley.

Part 3

Question 4

A Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Mesosphere	a. is a link between reptiles and birds.
2. Stratosphere	b. contains helium and hydrogen gases.
3. Archaeopteryx fossil	c. is caused by mercury pollutant.
4. Blindness	d. contains ozone layer.

B Give reasons for :

1. Water has high boiling point.
2. Simple ecosystem is affected strongly by the absence of one of its species.
3. Van-Allen belts play an important role in atmosphere.

C Calculate the height of a mountain if the temperature at its foot is 20°C and at its top is (–6°C).

4 Cairo Governorate — Leader Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. Mammoth is a type of elephants was extinct by ....
   a. winds. b. silica. c. snow. d. amber.
2. In the same group, the element which has the largest atomic size lies in group ....
   a. 1A b. 2A c. 5A d. 7A
3. A replice of the outer shell shape of the skeleton of a living organism is ....
   a. mold. b. trace. c. petrified wood. d. cast.
4. If the temperature at the sea level is 29°C, the temperature at the top of a mountain of height 4 km will be .... °C.
   a. 5 b. 3 c. zero d. 55

B Write the scientific term :

1. A gas that its liquid is used in preservation of the cornea of the eye.
2. Two magnetic belts surround the ionosphere and reflect the harmful cosmic radiation.
3. Traces and remains of old living organisms that are preserved at sedimentary rocks.

C Give one example for : Endangered animal.

Question 2

A Complete the following :

1. .... is the coldest atmospheric layer.
2. If an element (X) in the modern periodic table lies in period 2 and group zero, so its atomic number equals ....
3. .... is a continuous decrease in the number of a certain species of living organisms without compensation.
4. By increasing the atomic number in each group, the .... increases.

B Correct the underlined words :

1. We haven't to keep the tap water in **glass** bottles, because it reacts with chlorine gas causing cancer.
2. **Fluorine** is considered as the most active metal in the alkali metals group.
3. Moseley classified the elements in an ascending order according to their **atomic weights**.

C Give a reason for : Increasing the size of the ozone hole in September every year.

Question 3

A Complete the sentences by using words between brackets :

(index – radiolaria – metalloids – dodo bird – transition)

1. The elements that have both properties of metals and non-metals are ....
2. .... is a bird that disappeared due to its short wings.
3. .... fossil is the fossil that is used in petroleum exploration.
4. .... fossil is the fossil that is used in age determination of sedimentary rocks.

B Complete the following chemical equations :

1. $2Na + \text{..............} \longrightarrow 2NaOH + \text{..............}$
2. $2H_2O \xrightarrow{\text{Electrolysis}} \text{..............} + \text{..............}$
3. $Cl_2 + 2KBr \longrightarrow \text{..............} + \text{..............}$

C What is the importance of ... ? Cobalt 60

Question 4

A Put (✓) or (✗) :

1. Non-metal oxides dissolve in water forming acidic solutions. ( )
2. Pilots prefer to fly their planes in troposphere layer. ( )
3. Environmental pollution is one of the recent reasons of extinction. ( )
4. The bond between water molecules is single covalent bond. ( )

B Locate the position of the following elements in the modern periodic table :

1. $_{13}Al$ 2. $_{10}Ne$ 3. $_{11}Na$

C Compare between the following :

Group (1A) and group (7A) (according to : Name – Valency)

5 Cairo Governorate

Mokattam Educational Zone

Answer the following questions :

Question 1

A Choose the correct answer :

1. .... protectorate is the first established natural protectorate in Egypt.
   a. Saint Cathrine b. Ras Mohamed c. Wadi Hetan d. Panda
2. Sodium oxide is from .... oxides.
   a. amphoteric b. acidic c. basic d. magnetic
3. Each period in the modern periodic table starts with a/an .... element.
   a. metallic b. inert c. semi-metal d. nonmetallic
4. Meteors are formed in ....
   a. ionosphere. b. mesosphere. c. stratosphere. d. troposphere.

B Cross the odd word out :

1. Sodium – Potassium – Lithium – Argon.
2. Mammoth – Panda bear – Dinosaur – Dodo bird.
3. Near UV – Medium UV – Far UV – Infrared rays.

C Who is the scientist discovered the main energy levels ?

Question 2

A Put (✓) or (✗) :

1. The ozone layer is formed in the troposphere layer. ( )
2. Fossils are used to indicate the age of sedimentary rocks. ( )
3. Mixing human and animal wastes in seas and rivers causes thermal water pollution. ( )
4. Water and ammonia are from polar compounds. ( )

B Complete the sentences by using words between brackets :

(mesosphere – solid – atomic weights – liquid – atomic numbers – thermosphere)

1. Mendeleev arranged the elements ascendingly according to their ...., while Moseley arranged them ascendingly according to their ....

2. The hottest atmospheric layer is .... , while the coldest atmospheric layer is ....

3. Bromine exists in a .... state, while iodine exists in a .... state.

C Give a reason for : Pilots prefer flying their airplanes in the stratosphere atmospheric layer.

Question 3

A Correct the underlined words :

1. $2Na + \underline{\mathbf{Br_2}} \longrightarrow 2NaCl$
2. $\underline{\mathbf{O_2}}$ **gas** is from pollutants of the ozone layer.
3. The first fossil of a mammoth was discovered in **amber**.
4. The atomic size decreases in the same **group** by increasing the atomic number.

B Mention one example of :

1. A simple ecosystem.
2. An alkali metal.
3. A unit used to measure the degree of the ozone layer.

C Locate the position of the following element in the periodic table : $_{11}Na$

Question 4

A Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Corals	a. the layer that contains all weather phenomena.
2. Ferns	b. causes blindness.
3. Troposphere	c. are fossils that indicate that the environment, where they lived was a hot and rainy tropical.
4. Mercury	d. are fossils that indicate that the environment, where they lived was clear warm shallow seas.

B Write the scientific term :

1. A phenomenon looks like bright colorful light curtains seen in the two poles.
2. A bond that exists between water molecules.
3. Traces or remains of old living organisms were preserved in sedimentary rocks.

C Find the temperature at a height of 2 km. If the temperature at sea level is 25°C.

6 Cairo Governorate

Al Bayan Language School

Answer the following questions :

Question 1

A Complete the following :

1. Among the pollutants of ozone layer are .... compounds that are used in air conditioning sets, and .... compounds that are used in fire extinguisher.
2. Mendeleev arranged the elements ascendingly according to ...., while Moseley arranged them ascendingly according to ....
3. Most of weather conditions take place in .... layer, while satellites orbit around the Earth in .... layer.
4. Elements in group (1A) are called ...., while elements in group (7A) are called ....

B Locate the position of the following elements in the modern periodic table :

1. ${}^{23}_{11}Na$ 2. ${}^{4}_{2}He$ 3. ${}^{40}_{20}Ca$

C Write one example for simple ecosystem.

Question 2

A Put (✓) or (✗) in front of the following and correct the wrong ones :

1. Water and ammonia are polar compounds. ( )
2. The atomic size decreases by increasing the atomic number in the same group. ( )
3. The first discovered fossil of mammoth was found preserved in amber. ( )
4. Destroying the habitat is one of the factors that causes extinction. ( )

B Choose the correct answer :

1. Fossils are often found in .... rocks.
   a. volcanic b. sedimentary c. metamorphic d. igneous
2. .... is considered from halogens.
   a. Na b. Cl c. He d. Ca
3. The scientist .... discovered the main energy levels.
   a. Bohr b. Mendeleev c. Moseley d. Hofmann

C Calculate the temperature at the top of a mountain. If you know that the temperature at its foot is 25°C and its height is 2 km.

Question 3

A Write the scientific term :

1. Charged layer which reflects radio waves.
2. The continuous increase in the average temperature of the Earth's near surface air.
3. Dying out all members of species of living organisms.
4. The ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.

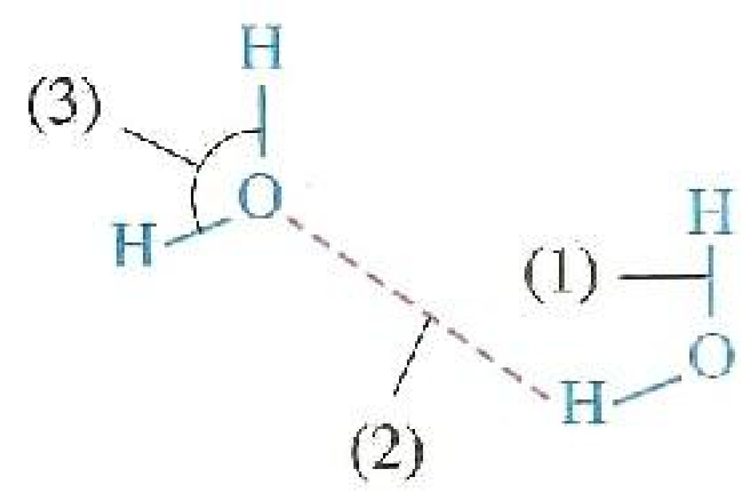
B Correct the underlined words :

1. **Troposphere** is the coldest atmospheric layer.
2. **Quagga** is from the most famous extinct species in the old times.
3. The measuring unit of ozone degree is **kilometer**.

C Mention one use for : Radioactive cobalt 60

Question 4

A From the opposite figure, answer the following questions :



1. What is the type of bond (1) & (2) ?
2. What is the measure of angle (3) ?
3. Which of the two bonds is stronger and which one is responsible for the abnormality properties of water ?

B Give reasons for :

1. Stop manufacturing of concorde aeroplanes.
2. Cesium is the most active metal in the modern periodic table.
3. El-Mokattam mountain was apart of a sea floor more than 35 million years ago.

C Complete the following equation :

$$Mg + 2HCl \xrightarrow{dil.} \ldots\ldots\ldots\ldots + \ldots\ldots\ldots\ldots$$

7 Giza Governorate — Dokki Educational Zone

Answer the following questions :

Question 1

A Choose the correct answer :

1. Ozone layer absorbs .... ultraviolet radiation.

a. far　　b. medium　　c. near　　d. all

2. .... is used to measure the possible day weather.

a. Aneroid b. Barometer c. Altimeter d. Compass

3. There is .... bond between oxygen atom and hydrogen atom in water molecules.

a. hydrogen b. single covalent c. double covalent d. metallic

4. .... is an example of fossils that carries external details of old living organism.

a. Ammonite b. Trilobite c. Fern cast d. Amber

B Give an example for :

1. A negative effect of global warming.
2. A metal more active than sodium.
3. A gas pollutes ozone layer.

C Calculate the atomic number of element (X) that lies in zero group and the third period.

Question 2

A Complete the following :

1. .... rays have chemical effect, while .... rays have thermal effect.
2. In the modern periodic table, elements are arranged according to .... and ....
3. Archaeopteryx is a link between .... and ....
4. During water electrolysis, the volume of the gas that evolves at anode is .... the volume of the gas that evolves at cathode.

B Correct the underlined words :

1. **Biological** pollution causes separation of the dissolved oxygen from water.
2. Amber fossil was formed when insect covered with **snow**.
3. Atmospheric pressure is measured in **Dobson unit**.

C Give a reason for :

The dead animals must be buried in a suitable medium to form fossils.

Question 3

A Write the scientific term :

1. Covalent compounds in which the difference in electronegativity between its elements is relatively high.
2. Safe areas established to protect endangered species in their homeland.
3. Block that includes alkali metals.
4. Charged layer in the atmosphere that reflects radio waves.

B Match :

(A)	(B)
1. Cobalt 60	a. causes global warming.
2. Methane gas	b. indicate warm shallow sea environment.
3. Coral fossils	c. is used to preserve food.
	d. indicate rainy forest environment.

C Show by equation :

Dissolving carbon dioxide in water.

Question 4

A Put (✓) or (✗) and correct the wrong ones :

1. Each period in the modern periodic table ends with alkali metal. ( )
2. Pilots prefer to fly their planes in the lower part of mesosphere. ( )
3. Overhunting is a human activity that protects living organisms from extinction. ( )
4. Transition elements are located in the middle of modern periodic table. ( )

B Cross the odd word out :

1. Radiolaria – Microfossils – Foraminifera – Trilobite.
2. Troposphere – Stratopause – Mesosphere – Thermosphere.
3. Dinosaur – Ibis bird – Dodo bird – Mammoth.

C If the temperature at sea level is 30°C what is the temperature at the top of a mountain whose height is 8 km.

8 Giza Governorate

Omrania Educational Zone

Answer the following questions :

Question 1

A Complete the following sentences :

1. The normal atmospheric pressure at the sea level is .... millibar.
2. Archaeopteryx is a link between .... and ....
3. From the greenhouse gases is ....
4. The atomic number of the element that lies in second period and group (3A) is ....

B Locate the position (period and group) , block and type of the following elements :

1. $_{10}Ne$ 2. $_{17}Cl$ 3. $_{12}Mg$

Part 3

C Write the chemical equation of :

Dissolving magnesium oxide in water.

Question 2

A Write the scientific term :

1. The gas that evolves at the cathode of Hofmann's voltameter.
2. A phenomenon looks like colorful light curtains seen in the two poles.
3. A kind of oxides results from dissolving of metal oxides in water.
4. Safe places to protect the endangered species.

B Cross the odd word out :

1. Sodium – Cesium – Chlorine – Lithium.
2. Altimeter – Barometer – Aneroid – Hofmann's voltameter.
3. Panda bear – Ibis bird – Quagga – Bald eagle.

C Calculate the height of a mountain if the temperature at its base is 25°C and at its top is (–14°C).

Question 3

A Choose the correct answer :

1. The charged cosmic radiations are dispersed (scattered) in the .... layer.
   a. troposphere b. stratosphere c. ionosphere
2. The fossils that indicate the environment was a hot and rainy tropical environment are .... fossils.
   a. nummulites b. ferns c. amber
3. The element which has the properties of both metal and non-metal is ....
   a. Si b. K c. F
4. .... is an example of microfossils.
   a. Mammoth b. Foraminifera c. Coral

B Put (✓) or (✗) :

1. In the same group, the element which has the largest atomic size lies in group (7A). ( )
2. The gas that results from burning fuel of ultrasound concorde airplanes is halon. ( )
3. Meteors are formed in mesosphere layer. ( )

C What is the importance of ...?

Liquefied nitrogen.

Question 4

A Correct the underlined words :

1. **Moseley** discovered the main energy levels.
2. The measuring unit of ozone degree is **Km**.
3. Petrified wood is considered from **rocks**.
4. Drinking water, which contains high ratio of mercury leads to **liver cancer**.

B Give reasons for :

1. The dodo bird is an easy target to hunt.
2. The lower part of stratosphere is suitable for flying planes.
3. Sodium is kept under the surface of kerosene.

C Complete the following equation :

$Cl_2 + 2KBr \longrightarrow$ .... + ...

9 Giza Governorate — *6th of October Educational Zone*

Answer the following questions :

Question 1

A Complete the following sentences :

1. Eating fish containing high ratio of lead causes the death of .... cells.
2. Normal atmospheric pressure equals .... mb at sea level.
3. .... is an example of traces fossils.
4. When sodium reacts with water, ... gas evolves.

B Complete using the following words :

(Stratosphere – Sodium – Mesosphere – $_{10}$Ne – Cesium)

1. .... locates in group zero.
2. .... is the coldest layer of atmosphere.
3. .... is the most active alkali metal.

C Complete with the suitable word :

The atomic number indicates the number of ....

Question 2

A Choose the correct answer :

1. .... is used in food preservation.

a. Cobalt 60 b. Sodium
c. Liquefied nitrogen d. Silicon

2. Ozone layer exists in the .... layer.

a. troposphere b. stratosphere c. exosphere d. mesosphere

3. Complete fossils of mammoth are found preserved in ....

a. metamorphic rocks. b. amber.

c. snow. d. igneous rocks.

4. Metal oxides are .... oxides.

a. acidic b. basic c. amphoteric d. neutral

B Cross the odd word out and mention what the rest has in common :

1. Blindness / Bilharzia / Typhoid / Hepatitis.

2. CO_2 / O_2 / CFC_s / CH_4 / N_2O 3. K / Na / O_2 / Li

C Give a reason for : Dodo bird is an easy target for hunters.

Question 3

A Write the scientific term :

1. Elements that have both properties of metals and nonmetals.
2. A gaseous envelope that surrounds Earth and rotates with it.
3. The death of all members of species of living organisms.
4. The ability of an atom in the covalent molecule to attract the bond electrons towards itself.

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Rutherford	a. discovered the main energy levels of the atom.
2. Aurora	b. is a unit used to measure the thickness of ozone layer.
3. Bohr	c. discovered that the nucleus contains positive protons.
	d. is a phenomenon appears as brightly colored curtains at the two poles.

C What happens in the following ...?

Drinking water contains high ratio of mercury.

Question 4

A Correct the underlined words :

1. Each period ends with **a metal**.
2. **Troposphere** is the hottest atmospheric layer.
3. **Mold** is a replica of the external details of structure of an old living organism.
4. Global warming phenomenon is the continuous **decrease** in the average temperature of the air near Earth's surface.

B Give an example of :

1. Polar compound. 2. Harmful rays. 3. Remains fossil.

C Complete :

Media which may preserve fossils from decomposition are .... and ....

10 Alexandria Governorate — El-Agami Educational Zone

Answer the following questions :

Question 1

A Write the scientific term of the following :

1. Elements that have properties of both metals and nonmetals.
2. Weak electrostatic attraction between the molecules of polar compounds.
3. Increase in the average temperature in the Earth's near surface air.
4. Traces and remains of old living organisms that preserved in sedimentary rocks.

B Complete the following :

1. The new number of group (7A) is .... and the new number of group zero is ....
2. During water electrolysis by using Hofmann's voltameter, ... gas evolved at anode and .... gas evolved at cathode.
3. From pollutants of ozone layer are .... that are used in cooling sets and .... that is used as insecticide to preserve agricultural crops.

C From the opposite figure, complete :



1. The name of this group is ....
2. The atomic size of (K) is .... than that of (Na).

Question 2

A Choose the correct answer :

1. The scientist who discovered the positive charged protons inside the nucleus is ....
   a. Bohr. b. Moseley. c. Mendeleev. d. Rutherford.
2. The element that has the same properties of $_{17}Cl$ is ....
   a. $_{11}Na$ b. $_{12}Mg$ c. $_{9}F$ d. $_{19}K$
3. The measuring unit of degree of ozone in nature is ....
   a. picometre. b. dobson. c. gm. d. cm^3
4. From recent extinct birds is ....
   a. dodo bird. b. bald eagle. c. ibis bird. d. quagga.

Part 3

B Choose the odd word out :

1. Na – Cl – Br – F
2. O_2 – N_2O – CH_4 – CO_2
3. Bilharzia – Typhoid – Influenza – Hepatitis.

C Give a reason for :

The complicated ecosystem is not affected by absence of one member.

Question 3

A Put (✓) or (✗) :

1. Yellowstone protectorate protects panda bear from extinction. ( )
2. Van-Allen belts surrounding ionosphere layer. ( )
3. The solid halogen is bromine. ( )
4. The biggest element in atomic size lies in group (7A). ( )

B Choose from column (B) what suits it in column (A) :

(A)	(B)
1. The number of elements in Mendeleev's table is	a. 13
2. The atomic number of the inert gas that exists in period (3) is	b. 118 c. 67
3. The thickness of troposphere layer is .... km.	d. 18

C Write the balanced chemical equation of the following reaction :

Magnesium with dilute hydrochloric acid.

Question 4

A Correct the underlined words :

1. **Mendeleev** put inert gases in zero group.
2. All **medium** ultraviolet radiation absorbed by ozone layer.
3. **Altimeter** is used to determine the possible day weather.
4. **Nummulite** fossils indicate that the environment was clear, warm and shallow seas.

B What happens when ...?

1. Drinking water that is stored in plastic bottles for long time.
2. Increasing the ratio of greenhouse gases in the atmosphere.
3. The resinous matter that is secreted from pine trees in old geologic ages was solidified on the insect.

C From the opposite figure, complete :

The name of this fossil is .... and its type is ....



11 Alexandria Governorate — Borg El-Arab Educational Zone

Answer the following questions :

Question 1

A Complete the following sentences :

1. During the chemical reaction, metal atom tends to .... electrons and changes into ....
2. The hottest layer in the atmosphere is ...., while the coldest layer in the atmospheric envelope is ....
3. Most of weather features occur in .... layer, whereas satellites swim through the .... layer.
4. Fossils are used in .... exploration and determining the age of ....

B Correct the underlined words :

1. Pure water has **an acidic** effect on both of litmus paper.
2. **Metallic** oxides are called acidic oxides.
3. **Ultraviolet** radiation has a thermal effect.

C Mention the difference between simple and complicated ecosystems.

Question 2

A Write the scientific term :

1. Charged layer reflects radio waves.
2. The curved lines that join the points of equal pressure in maps.
3. The ability of the atom in a covalent compound to attract the electrons of chemical bond to itself.
4. Safe areas established to protect endangered species in their homeland.

B Cross the odd word out :

1. Fluorine – Bromine – Boron – Iodine.
2. Dodo bird – Quagga – Bald eagle – Dinosaur.
3. CFC_s – Oxygen – Methane gas – Nitrous oxide.

C What happens when reacting chlorine with potassium bromide (write the equation) ?

Question 3

A Put (✓) or (✗) :

1. Lanthanides and actinides are found in f-block. ( )

2. Fossils are found in igneous rocks. ( )
3. The bond between water molecules is hydrogen bond. ( )
4. Eating food with high concentration of arsenic causes blindness. ( )

B Give an example for :

1. A complete body fossil.
2. A pollutant of ozone layer.
3. A metalloid.

C If the temperature at sea level is 24.5°C, find the temperature at the top of troposphere layer if its thickness is 13 kilometer.

Question 4

A Choose the correct answer :

1. The electronic configuration of magnesium ion (Mg^{+2}) is similar to all the following, except ....
   a. Na^+ b. $_{10}Ne$ c. Al^{+3} d. $_{18}Ar$
2. All of the following are natural disasters, except ....
   a. floods. b. volcanoes. c. drought. d. global warming.
3. Eye cornea is preserved under the surface of liquefied ....
   a. sodium. b. hydrogen. c. nitrogen. d. oxygen.
4. A type of ultraviolet rays that is absorbed completely in ozone layer is .... UV.
   a. far b. near c. medium d. thermal

B Give reasons for :

1. Elements of group (1A) are known as alkali metals.
2. The lower part of stratosphere is suitable for flying planes.
3. Although sugar is a covalent compound, it dissolves in water.

C Find the atomic number of each of the following :

1. An element exists in period (3) and group (7A).
2. An element exists in period (2) and group zero.

12 Qalyoubia Governorate

Banha Educational Zone

Answer the following questions :

Question 1

A Write the scientific term :

1. The number of positively charged particles found inside the nucleus of the atom.
2. The alkali metal which has largest atomic size.

3. The atmospheric layer which protects the Earth from celestial rocky masses.
4. The path of energy that transfers from a living organism to another.

B Mention an example for :

1. A halogen prepared artificially.
2. A metalloid (semi-metal) used in making electronic devices.
3. A covalent compound dissolves in water.

C Mention the importance of :

Litmus solution.

Question 2

A Choose the correct answer :

1. The number of elements that is found in the Earth's crust in the modern periodic table is .... elements.
   a. 92 b. 118 c. 26 d. 67
2. The atomic number for the element (X) that locates in second period and combines with oxygen to form a compound (X_2O) is ....
   a. 2 b. 4 c. 9 d. 3
3. The temperature at the top of stratosphere equals ....
   a. – 90°C. b. – 60°C. c. 0°C. d. 1200°C.
4. Complete body fossil of mammoth is found preserved in ....
   a. snow. b. ocean. c. amber. d. igneous rocks.

B Cross the odd word out, then write the name of the rest :

1. Typhoid – Hepatitis – Blindness – Bilharzia.
2. ${}_8O^{-2}$ – ${}_7N^{-3}$ – ${}_5B^{+3}$ – ${}_{12}Mg^{+2}$
3. Methyl bromide gas – Freon – Nitrogen oxides – Water vapour.

C Arrange the following fossils according to first appearance on life stage :

Crocodiles – Trilobite – Cast fossil of fish – Mammoth.

Question 3

A Complete the following sentences :

1. Transition elements are located in the .... of the modern periodic table in .... block.
2. In Hofmann's voltameter, oxygen gas evolves at .... , while hydrogen gas evolves at ....
3. If ozone degree at an area equals 225 Dobson, so the percentage (ratio) of erosion in this area will be .... %
4. Fossils are used in .... exploration and determining the age of ....

B From the following equations :

- $2Na + 2H_2O \longrightarrow (A) + (B)\uparrow$
- $2Mg + (C) \longrightarrow 2MgO$

1. Write the name for (A) , (B) & (C) and chemical formula for (A).
2. How can you differentiate between (B) & (C) ?

C Mention one difference between :

1. Troposphere and mesosphere. (according to the temperature at the end of each of them)
2. s-block and p-block. (according to the number of groups)

Question 4

A Correct the underlined words in each of the following :

1. Boiling point of liquefied nitrogen is **(78°C)**.
2. Wavelength of near ultraviolet rays is **280 : 315** nanometre.
3. **Altimeter** is a device used to determine the possible day weather.
4. **Ammonite** fossil represents an example of fossils of the complete body.

B Give reasons for :

1. The presence of hydrogen bond between water molecules.
2. Occurrence of all weather features in troposphere layer.
3. Desert ecosystem are strongly affected by absence of one of its species.

C If you know that the temperature at point at the middle of a mountain is (–2°C), while the temperature at its foot is (24°C), calculate the height of the mountain.

13 Sharkia Governorate

Science Inspectorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. The greatest density of water is at temperature ....
   a. 100°C. b. 4°C. c. zero°C.
2. The largest element in atomic size is ....
   a. fluorine. b. cesium. c. helium.
3. Atmospheric pressure at the end of the troposphere is .... millibar.
   a. 100 b. 1 c. 0.01
4. Among the extinct birds is ....
   a. quagga. b. dodo. c. ibis.

B Write the word that differs from the others :

1. Sodium – Chlorine – Fluorine – Iodine.
2. Typhoid – Hepatitis – Skin cancer – Bilharzia.
3. Methyl bromide gas – Nitrogen oxides – Oxygen – Halons.

C Locate the position of $_{11}Na$ and $_{17}Cl$ in the modern periodic table.

Question 2

A Complete the following sentences :

1. Halogens are located in group .... that belongs to the .... block.
2. $Mg + 2HCl \xrightarrow{dil.}$ .... + ...
3. Meteors are formed at .... layer and radio waves are reflected from the .... layer.
4. .... and .... are microfossils whose presence in exploratory wells indicates the presence of petroleum.

B Mention the name of the scientist that suits each statement :

(Rutherford – Van-Allen – Moseley – Mendeleev – Dobson – Bohr)

1. He predicted the discovery of new elements and determined the values of their atomic weights.
2. He assumed that the thickness of the ozone in S.T.P = 3 mm.
3. He discovered the positive protons in the nucleus.

C Mention the type of the following fossils :

1. Mammoth fossil. 2. Dinosaur's egg fossil.

Question 3

A Write the scientific term :

1. The ability of the atom in a covalent molecule to attract the electrons of the bond towards itself.
2. The group of elements on the far left side of the modern periodic table that reacts with water and gives alkaline solutions.
3. The continuous increase in the average temperature of the air near the Earth's surface.
4. Fossils of organisms that lived for short periods of time and then became extinct and never appeared again.

B Correct the underlined words :

1. Metals react with group (7A) and form **alkalis**.
2. **Liquefied nitrogen** is used in the manufacture of electronic devices.
3. Airplanes fly in the lower part of the **thermosphere**.

C If the sum of oxygen and hydrogen gases resulting from the electrolysis of water in Hofmann's voltameter = 60 cm^3, calculate the volume of oxygen gas and the volume of hydrogen gas.

Question 4

A Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Pollution resulting from the discharge of sewage and factory water into rivers.	a. Ras Mohamed
	b. Chemical
2. The device in airplanes used for altitude determination.	c. Aneroid
3. A natural protectorate in Egypt.	d. Coral
4. A fossil indicates that the area in which it is located was warm, clear and shallow seas in ancient times.	e. Altimeter
	f. Panda

B Put (✓) in front of the correct statements and (✗) in front of the incorrect ones :

1. The stratosphere layer contains 50% water vapour. ( )
2. The bonds between water molecules are hydrogen bonds. ( )
3. The green color on ozone maps indicates severe erosion. ( )

C Explain the difference between cast fossil and a fossil that indicates traces.

14 Menofia Governorate

Shebeen El-Koum Educational Zone

Answer the following questions :

Question 1

A Complete the following sentences :

1. An element, its nucleus has two protons, so it locates in .... group and .... block in the modern periodic table.
2. The atomic size determined by knowing the .... and its measuring unit is ....
3. The atmospheric envelope consists of layers according to changing occur in .... and ....
4. .... is the first protectorate in Egypt.

B Put (✓) or (✗) :

1. The scientist Rutherford discovered the main energy levels of atom. ( )
2. Each period in the modern periodic table ends with a metalloid element. ( )
3. Meteors are formed in mesosphere layer but clouds are formed in troposphere. ( )

C To whom are the following works belong :

1. Discovering positive protons in the nucleus of the atom.
2. Discovering main energy levels in the atom.

Question 2

A Choose the correct answer :

1. The volume of certain amount of water becomes larger at temperature .... °C.

   a. 40 b. zero c. 20 d. 4

2. The element which has atomic number equals (12) has the same properties of element which has atomic number equals ....

   a. 2 b. 8 c. 17 d. 20

3. If the temperature at the top of a mountain is less than the temperature at its base by 26°C, then the height of the mountain equals .... meter.

   a. 1000 b. 3000 c. 4000 d. 2000

4. When sediments fill up the shell cavities and solidify, the .... fossil is formed.

   a. solid mold b. empty mold c. trace d. cast

B Write the scientific term for each of the following :

1. An element which causes death of brain cells when its concentration increases in water.
2. Charged layer that reflects radio waves.
3. The gas which evolves above the cathode in Hofmann's voltameter during electrolysis of water.

C Give a reason for :

Not all known fossils are considered as index fossil.

Question 3

A Correct the underlined words :

1. Some basic oxides dissolve in water forming **salts**.
2. Molecule of halogen consists of **one atom**.
3. Medium ultraviolet radiation is absorbed by **10%** in ozone layer.
4. Some insects were preserved completely in **ammonites**.

B Cross the odd word out and link the rest in meaningful statements :

1. Sodium – Lithium – Potassium – Chlorine.
2. Boron – Helium – Silicon – Arsenic.
3. Barometer – Aneroid – Thermometer – Altimeter.

Part 3

C From the opposite figure what is the type of forming oxide ?
Write the chemical equation of this reaction.



Question 4

A Choose from column (B) what suits it in column (A) :

(A)	(B)
1. From covalent compounds which doesn't dissolve in water.	a. Van-Allen belts
2. Known as an ozonic atmospheric envelope.	b. quagga
3. Scattering cosmic rays.	c. oil
4. An extinct mammal animal.	d. stratosphere layer

B Give reasons for :

1. Water molecule is from polar molecules.
2. Occurrence of global warming phenomenon.
3. Mammoth fossil is considered from complete body fossils.

C What are the consequences of the following :

The absence of one type of species from environmental balanced desert.

15 Gharbia Governorate — Science Inspectorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The modern number of group (2B) is ....
2. Some metals react with dilute acids giving .... and hydrogen gas evolves.
3. The atmosphere permits the passage of .... and short-waved rays coming from the Sun to be absorbed by Earth in the greenhouse.
4. There is .... fossils in the limestone rocks, which form El-Mokattam mountain.

B Correct the underlined words :

1. **Sodium** is the lowest metallic element in group (1A).
2. The high boiling point of water is due to the presence of **double covalent** bonds between its molecules.
3. The atmospheric pressure in stratosphere layer decreases as we go up until it becomes **100** mb.

C The opposite figure represents the reaction of a piece of sodium with water :



1. Write the equation of the reaction.
2. How can you detect the evolved gas ?

Question 2

A Write the scientific term of each of the following sentences :

1. Monovalent elements exist in p-block in the periodic table.
2. A type of water pollution, which causes the death of marine creatures due to the separation of the dissolved oxygen in water.
3. A molecule is formed by combining an atom of an element with a molecule of the same element.
4. A protectorate in the USA is established to protect the grey bear from extinction.

B Choose the odd word out, then write the suitable name for others :

1. CO_2 – MgO – Na_2O – CaO
2. s – k – d – f – p
3. Methyl bromide – Carbon dioxide – Water vapour – Methane gas.

C What is the difference between ...?

A mold and a trace.

Question 3

A Put (✓) or (✗) and correct the wrong ones :

1. Magnesium and potassium are kept under the surface of kerosene. ( )
2. Sulphuric acid is produced when carbon dioxide gas dissolves in water. ( )
3. The thickness of troposphere layer is 37 kilometres. ( )
4. Archaeopteryx represents a link between reptiles and birds. ( )

B Choose the correct answer :

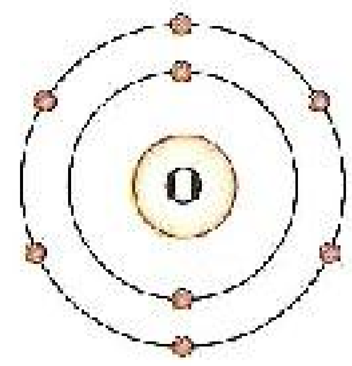
1. One Dobson unit is defined as ....
   a. 3 mm. b. 0.1 mm. c. 0.01 mm. d. 0.001 mm.
2. .... of the mass of air is located up to 16 km height above the sea level.
   a. 10 % b. 40 % c. 50 % d. 90 %
3. If the summation of the volume of the two evolved gases at the two poles of Hofmann's voltameter is 60 cm^3, so the volume of hydrogen and oxygen gases respectively is ....
   a. 20 cm^3, 40 cm^3. b. 40 cm^3, 20 cm^3.
   c. 30 cm^3, 30 cm^3. d. 10 cm^3, 50 cm^3.

C What happens when ...?

Increase in the ratio of arsenic in drinking water.

Question 4

A Answer the following questions :



1. a. What is the location of this element in the modern periodic table ?

   b. This element is located in the same group with .... in the modern periodic table.

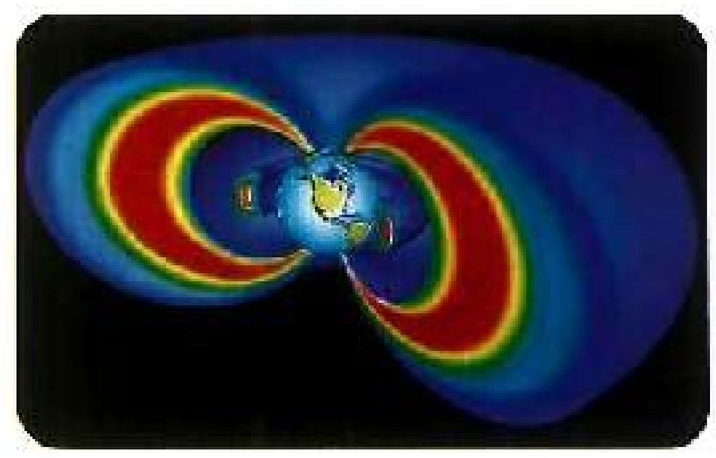
   a. $_5B$ b. $_{16}S$ c. $_{19}K$ d. $_{10}Ne$

2. Calculate the percentage of erosion in ozone layer in a certain area, knowing that ozone degree at this area is 255 dobson.

3. a. How is amber produced ?

   b. What is the type of organisms that is preserved in amber ?

4. The opposite figure represents the two magnetic belts that surround the Earth planet :



   a. What is their scientific name ?

   b. Where are they located ?

B Give reasons for :

1. Aluminium oxide is considered as an amphoteric oxide.
2. Mesosphere layer is highly rarefied.
3. Nummulites fossils are considered as index fossils.

C Calculate the height of a mountain if the temperature at its foot is 30°C and at its top is (–6°C).

16 Dakahlia Governorate

Science Inspectorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. The element which locates in group (18) and in first period, its atomic number = ...

   a. 18 b. 10 c. 2 d. 1

2. In period three in the modern periodic table, ... increase from left to right.

   a. atomic number and metallic property

   b. atomic size and metallic property

   c. atomic number and nonmetallic property

   d. atomic size and nonmetallic property

3. The temperature at the middle of a mountain is (10°C) and at its top is (–3°C), so the height of the mountain equals .... km.

a. 2 b. 4 c. 6 d. 8

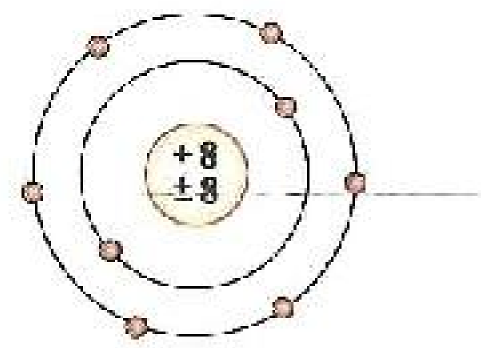
4. .... is an example of microfossils.

a. Radiolaria b. Amber c. Trilobite d. Ferns

B Fill in the blanks after copying it in your answer sheet :

1. Elements of d-block are known as .... and they start to appear from period ....
2. $Mg + 2HCl \xrightarrow{dil.}$ .... + ...
3. Satellites float in .... layer, while meteors are formed in .... layer.

C From the opposite figure :



1. What is the block of this element ?
2. Conclude the atomic number of the element which follows it in the same group.

Question 2

A Put (✓) or (✗) :

1. Density of sodium is lower than density of lithium and higher than density of cesium. ( )
2. Liquefied nitrogen is used in the preservation of cornea of the eye and its boiling point is 196°C. ( )
3. If the atmospheric pressure at the top of a mountain is 710 mbar, so the pressure at its foot is about 1000 mbar. ( )
4. Desert is a complicated ecosystem which is not affected by the absence of one of its species. ( )

B Cross the odd word out and write the related of other words :

1. ${}_{15}P^{-3}$ – ${}_{7}N^{-3}$ – ${}_{19}K^{+}$ – ${}_{20}Ca^{+2}$
2. Fluorine – Chlorine – Hydrogen – Iodine.
3. Temperature at its top 0°C – Air moves horizontally – Contains ozone layer – Contains (99%) of water vapour.

C Describe the environment where the following fossils lived :

1. Coral fossils. 2. Nummulite fossils.

Question 3

A Write the scientific term :

1. A group of elements starts from group (3A) and ends with zero group.
2. The bonds that cause abnormal properties of water.
3. Apparatus is used in airplanes to measure the elevation of navigation.
4. It contains complete whales skeleton fossils 40 million years ago.

B Select from column (B) the option that best corresponds to column (A) after copying it in your answer sheet :

(A)	(B)
1. Discovered the main energy levels of the atom.	a. Methyl bromide
2. Discharging factories wastes and sewage in seas and rivers.	b. Bohr
3. Pollutants of ozone layer.	c. Rutherford
	d. Carbon dioxide
	e. Chemical pollution
	f. Biological pollution

C $\boxed{M} \longleftarrow Cl_2 + \boxed{{}_{19}K} + H_2O \longrightarrow R + \text{gas } X$

1. What is the chemical name of (M) and (R) ?
2. What is the name of the gas X and how can you test it ?

Question 4

A Specify on differentiation between :

1. ${}_{19}K$ and ${}_{15}P$ (concerning electronic configuration)
2. Troposphere and mesosphere. (according to its top temperature)
3. Ozone and oxygen. (concerning number of atoms)
4. Quagga and bald eagle. (according to the type)

B What happens when ...?

1. Passing an electric current in acidified water (show by chemical equation).
2. The rate of greenhouse gases increases in troposphere layer.
3. The frog is absent from the following food chain.
(green plant ⟶ locust ⟶ frog ⟶ snake ⟶ owl).

C Give an example for each of the following :

1. A petrified fossil.
2. An organism represents a link between reptiles and birds.

17 Ismailia Governorate

Science Inspectorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. Transition elements start to appear from period number .... and they consist of .... groups.

2. Radioactive cobalt 60 is used in ...., while liquefied nitrogen is used in ....
3. Ultraviolet radiation has .... effect, while infrared radiation has .... effect.
4. Archaeopteryx fossil is a link between .... and ....

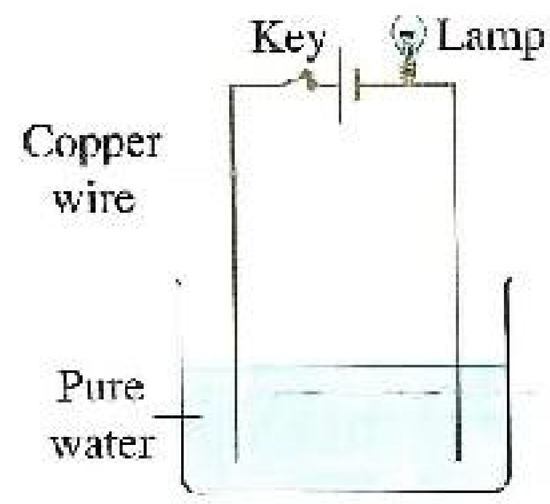
B **Give one example for each of the following :**

1. An Element causes death of brain cells.
2. A basic oxide.
3. A greenhouse gas.

C **From the opposite electric circuit fill the space :**

The lamp will .... (illuminate – not illuminate)

because pure water is ....



Question 2

A **Write the scientific term :**

1. Elements that have the properties of metals and nonmetals.
2. The ion which carries a number of charges equals to the number of gained electrons.
3. A charged layer reflects radio waves and found in upper part of thermosphere layer.
4. The death of all members of species of living organisms.

B **Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Hofmann's voltameter is used in	a. scatter the harmful cosmic radiation.
2. Silicon slides are used in	b. electrolysis of acidified water.
3. Van-Allen Belts	c. making electronic devices.
	d. determine the possible day weather.

C **Look at the figures of these land animals, then mention the name of each one and classify it extinct or endangered :**



Figure (1)



Figure (2)

Part 3

Question 3

A Choose the correct answer :

1. The scientist .... discovered that the nucleus of atom contains positively charged protons.

   a. Bohr b. Rutherford c. Moseley d. Newton

2. Non-metal oxides are called .... oxides.

   a. acidic b. amphoteric c. basic d. salty

3. Ozone layer is found in .... layer.

   a. troposphere b. mesosphere c. thermosphere d. stratosphere

4. Complete body fossils of insects are found preserved in ....

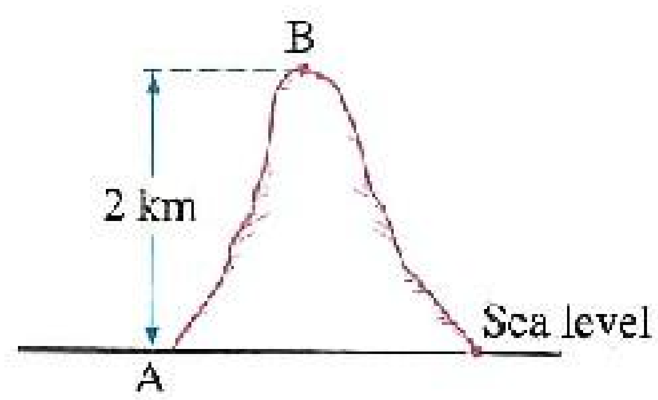
   a. ammonites. b. amber. c. air. d. snow.

B Correct the underlined words :

1. There is **covalent** bonds between water molecules.
2. The element which has an atomic number equals to (18) is **a metallic element**.
3. Atmospheric pressure is measured by a unit called **meter**.

C Problem :

From the opposite figure calculate the temperature at the top of the mountain (B) if you know that the temperature at the sea level is 20°C.



Question 4

A Cross the odd word out and write the scientific term of the rest of words :

1. Lithium – Sodium – Helium – Potassium.
2. Freon – Methyl bromide gas – Oxygen – Nitrogen oxides.
3. Barometer – Aneroid – Thermometer – Altimeter.
4. Dinosour's tooth – Dinosaur's egg – Cast of fish – Petrified wood.

B Compare between each of the following :

1. Alkali metals and halogens. (according to the block)
2. Troposphere and stratosphere. (according to the temperature at the top)
3. Ferns fossils and coral fossils.

C Study the opposite figure, then fill the spaces :

In the absence of frogs :

1. Snakes .... due to food shortage.
2. Numbers of locusts will .... and disturb ....



18 Port Said Governorate

Port Said Educational Zone

Answer the following questions :

A Choose the correct answer :

1. The element used in a liquid state to obtain the vapour energy required to generate electricity is the ....
   a. Mg b. Na c. Cu d. Pb
2. An example of a complete body fossil is the ....
   a. mammoth. b. dinosaur tooth. c. ammonite. d. coral.
3. Chlorine replaces .... in potassium iodide solution.
   a. F b. Br c. S d. I
4. Air pressure at the top of a mountain is .... air pressure at the sea level.
   a. greater than b. lower than c. equal to d. the double of
5. The oxide which dissolves in water and forms an acidic solution is ....
   a. MgO b. H_2CO_3 c. Na_2O d. CO_2
6. An example of the solid mold is the ....
   a. fish cast. b. ammonite. c. mammoth. d. amber.
7. The density of pure water at 0°C ÷ its density at 4°C is .... one.
   a. greater than b. equal to c. lower than d. the double of
8. The fern fossil is a/an .... fossil.
   a. solid mold b. petrified c. empty mold d. cast
9. The scientist .... discovered the main energy levels in the atom.
   a. Mendeleev b. Moseley c. Bohr d. Rutherford
10. The .... layer plays an important role in wireless communication and broadcasting.
    a. troposphere b. stratosphere c. mesosphere d. ionosphere
11. Using water for cooling nuclear reactors produces .... pollution.
    a. biological b. thermal c. chemical d. radiant
12. Archaeopteryx fossil links between ....
    a. fish and amphibians. b. reptiles and birds.
    c. birds and mammals. d. amphibians and reptiles.
13. If the total volume of the two gases evolved at the two electrodes of Hofmann's voltameter is 90 cm^3, the volume of the gas that burns with a pop sound will be .... cm^3.
    a. 90 b. 60 c. 30 d. 20

14. If temperature at the sea level is 30°C and temperature at the top of a mountain is 4°C, the height of the mountain will be .... km.

a. 2 b. 3 c. 4 d. 5

15. The atomic size is measured in the unit of ....

a. atomic number. b. picometre. c. atomic radius. d. valency.

16. The .... protectorate contains skeletons of whales' fossils that are 40 million years old. -

a. Wadi El-Nile b. Wadi El-Raiyan c. Wadi El-Natroun d. Wadi El-Gedeed

17. The element which has the smallest atomic size is ....

a. $_{12}Mg$ b. $_{15}P$ c. $_{11}Na$ d. $_{17}Cl$

18. From living organisms that are threatened by extinction is the ....

a. dodo bird. b. quagga. c. dinosaur. d. ibis bird.

19. The scientist .... discovered that the nucleus of the atom contains positively charged protons.

a. Mendeleev b. Moseley c. Bohr d. Rutherford

20. Recent extinctions of living organisms are attributed to ....

a. destruction of the original habitat. b. toxic gases evolved from volcanoes.
c. exposure of Earth to long ice age. d. collision of meteors with Earth.

21. The number of electrons found in the ion of a divalent metal that is found in the fourth period is ....

a. 20 b. 18 c. 10 d. 2

22. From the examples of the complex ecosystems are the ....

a. tropical forests. b. deserts. c. protectorates. d. water ponds.

23. The properties of the element whose atomic number is 9 are similar to the properties of the element whose atomic number is..............

a. 7 b. 8 c. 17 d. 19

24. The ozone degree is measured in the unit of ....

a. kilometre. b. Dobson. c. nanometre. d. mm^3.

25. The gas which evolves when sodium reacts with water is ....

a. N_2 b. O_2 c. CO_2 d. H_2

B Answer the following questions :

26. **What happens in case of ... ?** (explain using balanced chemical equation)

Burning of a piece of coal in oxygen.

27. **Replace by a scientific term :**

Compounds which result from the burning of fuels in the ultrasound concorde airplanes.

28. **Mention one example of :** a basic oxide which dissolves in water.
29. **Replace by a scientific term :**
    Elements which have the properties of metals and non-metals.
30. **What happens in case of ... ?**
    The altimeter stops working, while an airplane is flying in the atmosphere.
31. **Complete :** There are .... bonds between water molecules and .... bonds between its atoms.
32. **What is the importance of ... ?** Van-Allen belts.
33. **Find the atomic number of :** the element (Y) in the opposite figure.
34. **Give a reason for :** Mesosphere is the most vacuumed atmospheric layer.
35. **Give a reason for :** Alkali metals are kept under the surface of kerosene.

$_9X$
Y
Z
L

19 Minia Governorate — Deir Mawas Educational Zone

Answer the following questions :

Question 1

A Write the scientific term :

1. Remains or traces of organisms that lived in the past and were preserved in sedimentary rocks.
2. Thinning or losing part of ozone layer above the south pole.
3. The first real periodic table for classifying elements.
4. A kind of water pollution, which arises from mixing animal and human wastes with water.

B Write the name of the scientist who :

1. Discovered that ionosphere is surrounded by two magnetic belts.
2. Discovered the main energy level.
3. Named the term of atomic number of an element on the number of positive protons in the nucleus.

C Write one example for :

1. Liquid halogen.
2. Basic oxide.

Question 2

A Complete the following sentences :

1. The atoms of water molecule joined together by .... bonds.
2. Satellites revolve in .... layer.
3. .... is an extinct bird in the recent times.
4. Transition elements start from period .... in the modern periodic table.

B Match from the column (B) which is suitable to column (A) :

(A)	(B)
1. Halons	a. preservation of cornea of eyes.
2. Liquefied nitrogen	b. the environment was clear warm shallow sea.
3. Coral fossils	c. they are used in extinguished fires.

C Look at the opposite figure, then answer :

1. What is the name of this animal ?
2. Does it from extinct or endangered species ?



Question 3

A Put (✓) or (✗) :

1. Bar is used in measuring atomic size. ( )
2. Ras Mohamed protectorate is the first established protectorate in Egypt. ( )
3. Infrared radiation has chemical effect. ( )
4. The number of elements in the modern periodic table is 67 elements. ( )

B Choose the odd word out :

1. Potassium – Sodium – Argon – Cesium.
2. Tropopause – Stratopause – Mesopause – Troposphere.
3. Noisy pollution – Chemical pollution – Radiant pollution – Thermal pollution.

C Complete the following chemical equations :

1. $Cl_2 + \text{..............} \longrightarrow 2NaCl + Br_2$
2. $CO_2 + \text{..............} \longrightarrow H_2CO_3$

Question 4

A Correct the underlined words :

1. Archaeopteryx is considered a link between reptiles and <u>**mammals**</u>.
2. <u>**Thermometer**</u> is used to determine the possible day weather based on atmospheric pressure.
3. <u>**CO_2**</u> is from the greenhouse gases and pollutants of ozone layer.
4. An element its atomic number is 19, so it lies in group (<u>**7A**</u>).

B Give reasons for the following :

1. Water and ammonia are from polar compounds.
2. Stratosphere is called ozonic atmospheric envelope.
3. Petrified woods are considered as fossils although they look like rocks.

C Compare between :

Simple ecosystem and complicated ecosystem (according to giving one example of each).

20 Luxor Governorate — Abu Bakr Official Language School

Answer the following questions :

Question 1

A Choose the correct answer :

1. Each period in the modern periodic table starts with a/an ....
   a. non-metal. b. metal. c. inert gas. d. metalloid.
2. In water molecule, there are .... bonds between oxygen and hydrogen.
   a. single covalent b. double covalent c. ionic d. hydrogen
3. The normal atmospheric pressure is .... millibar.
   a. 1.013 b. 1013.25 c. 760 d. 76
4. .... is from microfossils.
   a. Amber b. Fern c. Foraminifera d. Archaeopteryx

B Write one importance for each of the following :

1. Van-Allen belts.
2. Liquefied nitrogen.
3. Silicon.

C Calculate the temperature at a point of height 2000 metres above sea level if the temperature at sea level is 33°C.

Question 2

A Correct the underlined words in the following statements :

1. According to fossil record, the first appeared vertebrates were **birds**.
2. **Bohr** discovered that the nucleus contains positively charged protons.
3. **Fluorine** is the strongest metal.
4. When water freezes, its **density** increases.

B Choose the odd word out, then write the scientific term of the others :

1. Halons – Nitrous oxide gas – CO_2 – Methane gas.
2. Cast – Mold – Fossil record – Petrified wood.
3. Ibis bird – Panda bear – Quagga – Bald eagle.

Part 3

C Complete the following chemical equations with balance :

1. $2Na + 2H_2O \longrightarrow$ .... + ...
2. $Mg + 2HCl \xrightarrow{dil.}$ .... + ...

Question 3

A Write the scientific term :

1. Fossils that lived for a short period of time and had wide distribution.
2. Ability of an atom to attract the electrons of the bond towards itself.
3. The radioactive element that is used in food preservation.
4. A metal used in a liquid state for cooling nuclear reactors.

B Mention one example for each of the following :

1. A liquid halogen.
2. A trace fossil.
3. An endangered plant.

C Compare between :

Simple ecosystem and complicated ecosystem (according to alternatives and example).

Question 4

A Complete the following sentences :

1. Increasing the concentration of .... causes blindness, while increasing the concentration of .... causes death of brain cells.
2. Most of weather phenomena occur in .... , while meteors burn in ....
3. Fossils are important in .... determination and studying .... of life.
4. Water is a good polar solvent for most of .... and some of ....

B Put (✓) or (✗) :

1. Modern periodic table contains 7 groups and 18 periods. (   )
2. Ultraviolet rays have thermal effect, while infrared rays have chemical effect. (   )
3. Methyl bromide gas is used as chemical insecticide. (   )

C Give reasons for :

1. Petrified forests are named as wood mountain.
2. Pilots prefer to fly their planes in stratosphere.

SCIENCE

GUIDE ANSWERS

FIRST TERM

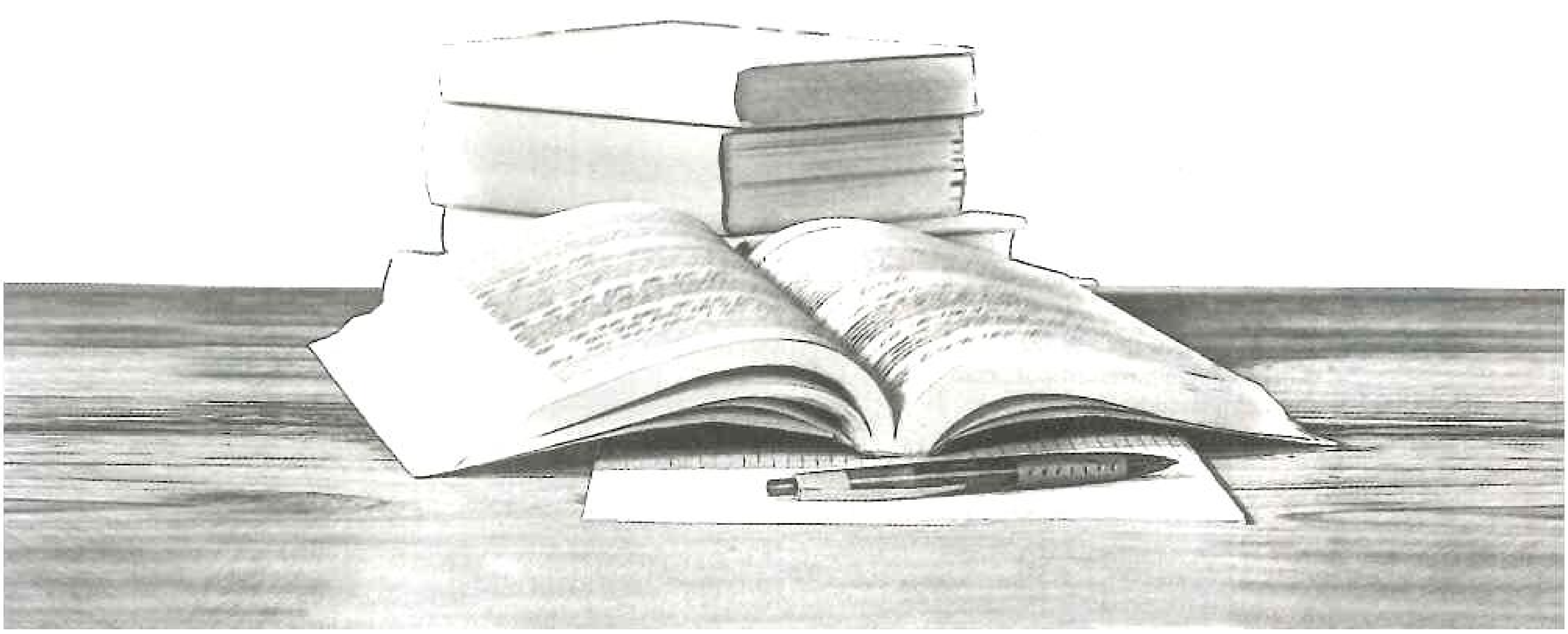
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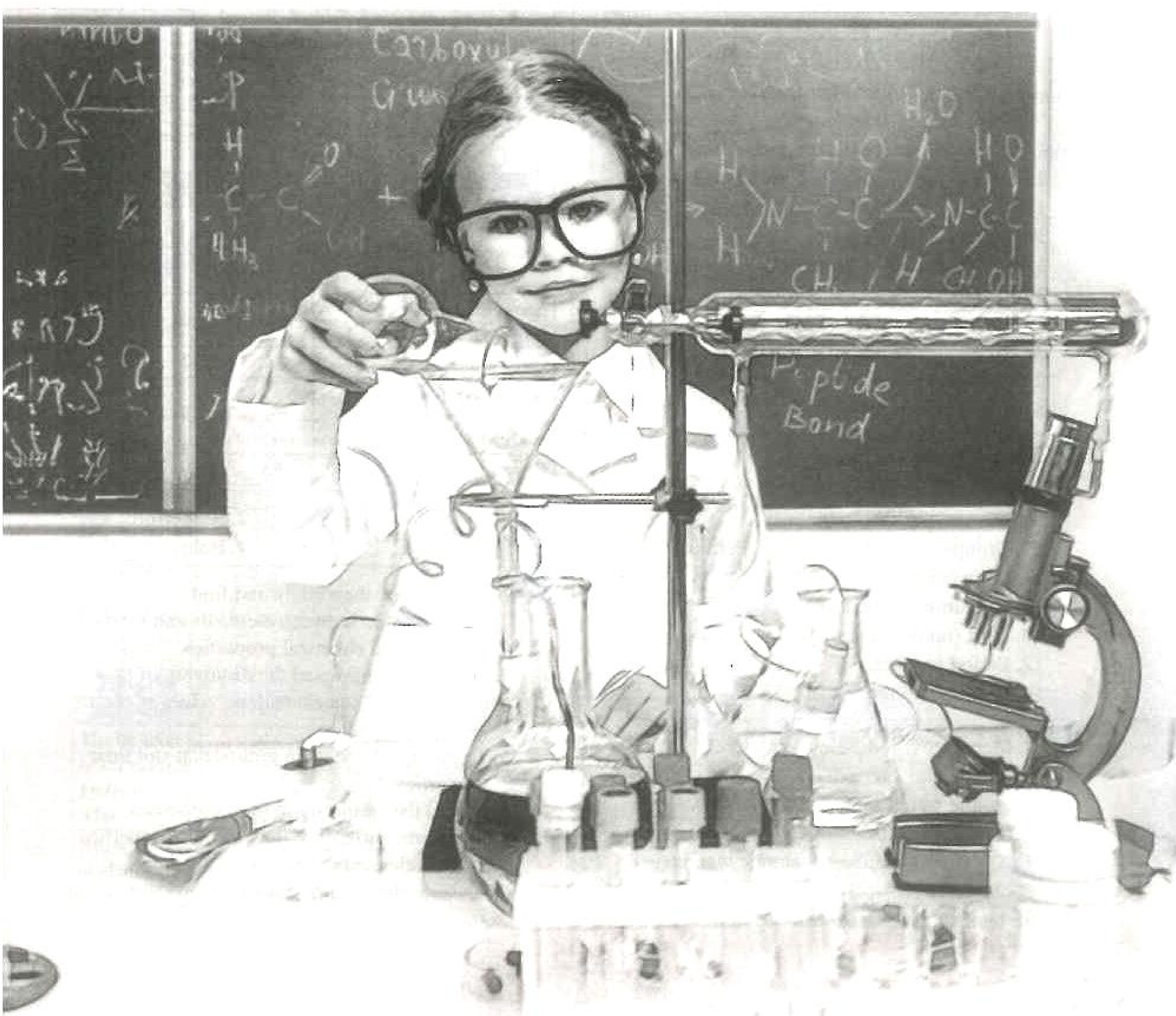
Contents



PART 1

Guide Answers of

The Main Book



Unit One

Lesson 1

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7. b	8. b	9. c	10. a	11. d	12. b
13. a	14. c	15. a	16. d	17. d	18. d
19. d	20. c	21. a	22. b	23. a	24. d
25. a	26. b	27. c	28. c	29. b	30. b

2 1. c 2. d 3. a 4. b

3 1. c.B 2. d.A 3. a.E 4. b.D

4
1. (✓)
2. (✗) Mendeleev's periodic table is ....
3. (✗) .... put in vertical groups.
4. (✗) .... 67 elements.
5. (✗) .... new period.
6. (✗) .... ascendingly ....
7. (✓) 8. (✗) Mendeleev ....
9. (✗) .... is 118 elements.
10. (✓) 11. (✗) .... into 4 blocks.
12. (✓) 13. (✗) .... on the right side ....
14. (✓) 15. (✗) .... 6 groups.
16. (✗) .... by (B).
17. (✗) Elements of groups (B) ....
18. (✗) .... its period number.
19. (✗) The group number of ....
20. (✓) 21. (✗) .... is 12
22. (✓) 23. (✗) .... same period ....
24. (✓)

5
1. Mendeleev's periodic table.
2. Moseley's periodic table. 3. Protons.
4. Modern periodic table.
5. Groups. 6. Periods.
7. Main energy levels.
8. Transition elements. 9. p-block.
10. Inert (noble) gases. 11. f-block.
12. Period number. 13. Group number.
14. Atomic number.

6
1. Mendeleev – Moseley – modern
2. left – right – periods.
3. atomic weights
4. atomic weights – atomic numbers.
5. X – atomic numbers – atomic weights.
6. one electron – period. 7. protons.
8. lanthanides – actinides 9. Bohr – 7
10. sublevels.
11. their atomic numbers – way of filling their energy sublevels with electrons.
12. 118 – 92 – artificially. 13. 7 – 18
14. left – 1A – 2A 15. right – six
16. 16 – 6 17. B – 8 – three
18. transition 19. 4 – 10
20. 18 – 15 21. left – right
22. period – group 23. 2 – 5A
24. 11 25. 3 – 3A
26. second – 1A 27. zero – 2
28. 12 29. group – period

7

①

Element	Its atomic number	Its electronic configuration			Its position in periodic table	
		K	L	M	Period No.	Group No.
$_{6}C$	6	2	4	–	2	(4A)
$_{8}O$	8	2	6	–	2	(6A)
$_{12}Mg$	12	2	8	2	3	(2A)
$_{17}Cl$	17	2	8	7	3	(7A)

②

Element	$_{20}Ca$	$_{15}P$	$_{10}Ne$	$_{1}H$
Electronic configuration :	(+20) K L M N: 2 8 8 2	(+15) K L M: 2 8 5	(+10) K L: 2 8	(+1) K: 1
No. of energy levels :	4	3	2	1
Period number :	4	3	2	1
No. of electrons in the outermost energy level :	2	5	8	1
Group number :	2 A	5A	0	1A

8
1. Mendeleev. 2. Rutherford.
3. Moseley. 4. Bohr.

9
1. To facilitate their study and find a relationship between elements and their physical and chemical properties.
2. Because he predicted the discovery of new elements and determined the values of their atomic weights.
3. To put the elements in groups that suit their properties.
4. Due to the similarity in their properties.
5. Due to the difference between the properties of their elements.
6. Because their atoms have the same number of electrons in the outermost energy level.

7. Because their outermost energy level contains the same number of electrons (one electron).
8. Because their atoms have the same number of energy levels occupied by electrons (2 levels).
9. Because the atomic number of an element is an integer and it increases in the same period from an element to the following element by one electron.

10

	Period	Group
1.	1	1A
2.	2	5A
3.	2	4A
4.	2	0
5.	3	2A
6.	3	7A
7.	3	0
8.	4	2A
9.	2	6A
10.	4	1A
11.	3	6A
12.	2	3A
13.	3	5A
14.	3	1A
15.	3	3A

11 1. 1   2. 2   3. 12   4. 17   5. 18   6. 5

12

Odd symbol	Scientific term
1. F	Symbols of some main energy levels.
2. k	Symbols of blocks of the modern periodic table and also symbols of energy sublevels.
3. $_{12}Mg$	Symbols of some elements of group (1A).
4. $_{12}Mg$	Symbols of some noble gases.
5. $_{13}Al$	Symbols of some elements of second period.

13 1. 67   2. 7   3. 118   4. 92
5. 4   6. 2   7. 6   8. 10

14 1. *Look at the main book on page (12).*

2.

Points of comparison	p-block	d-block
The location in the modern periodic table :	On the right side of the periodic table.	In the middle of the periodic table.
No. of groups of elements :	6	10

3.

Points of comparison	s-block	p-block
The location in the modern periodic table :	On the left side of the periodic table.	On the right side of the periodic table.
No. of groups of elements :	2	6

4.

Points of comparison	$_{11}Na$	$_{17}Cl$
Electronic configuration :	2 , 8 , 1	2 , 8 , 7
Period no. :	3	3
Group no. :	1A	7A
The block symbol :	s-block	p-block

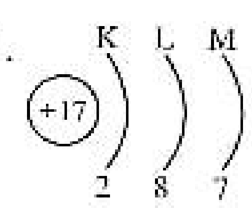
15

① *Look at the main book on page (21).*

② 1. An ascending order according to their atomic weights.
2. An ascending order according to their atomic numbers.

③ An ascending order according to their atomic numbers and the way of filling their energy sublevels with electrons.

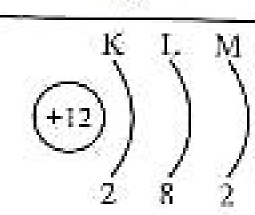
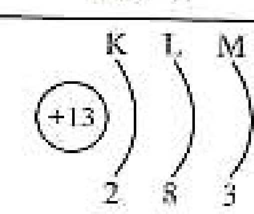
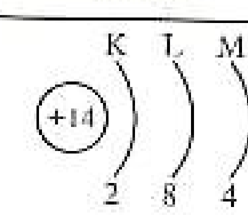
④ *Look at the main book on pages (9 & 10).*

⑤ 1. 

2. 7A   3. 3

⑥ 1. Group 2A (2), because the number of electrons in the outermost energy level in the atom of each of them equals 2 electrons.
2. s-block, because their elements belong to group 2A (2).
3. $_{12}X$, because it has 3 energy levels occupied by electrons.

⑦

	($_{12}X$)	($_{13}Y$)	($_{14}Z$)
1			
2	Period (3) and group (2A).	Period (3) and group (3A).	Period (3) and group (4A).
3	s-block.	p-block.	p-block.

⑧ 1. (a). 11 (b). 11 + 12 = 23

2. (a). s-block (b). 1A

16

① The periodic table is Mendeleev's periodic table. Because the numbers present in it are atomic weights not atomic numbers (which are integer numbers).

② 1. Period (3).
Because the electrons of atoms of these elements orbit in 3 energy levels.

2. (a). 2A (2).
(b). 6A (16).
(c). Zero (18).

3. No, it does not contain element from d-block. Because elements of d-block start to appear from period number (4).

4. (a). Na and Mg
(b). Al ; Si , P , S , Cl and Ar.

③ 1. Period (2).

2. 2A (2).

3. ∵ Element (A) locates in the second period and group (1A).
∴ The atomic number of the element which follows it in the same group (1A), and locates in third period = 2 + 8 + 1 = 11

4. p-block.

5. Inert gas – monovalent.

④ 1. X is s-block.
Y is d-block.
Z is p-block.

2. X consists of 2 groups.
Y consists of 10 groups.
Z consists of 6 groups.

3. Zero group is (18) and group (7A) is (17).

⑤ ∵ The atomic number of element (X) = 2 + 2 = 4 and it has 2 energy levels.
∴ The atomic number of the element that follows element (X)
1. In the same period = 4 + 1 = 5
2. In the same group = 2 + 8 + 2 = 12

⑥ 1. In period 2 and group (6A).

2. p-block. 3. b

⑦ 1. (a) B (b) M
(c) X (d) Z and A
(e) p

2. (a) d (b) c (c) c

3. 16

⑧ 1. ∵ Element (A) precedes element (B) in the same group.
∴ Element (A) is located in period (2) and zero group.
∴ Atomic number of element (A) = 2 + 8 = 10

2. electrons in the outermost energy level (8 electrons).

⑨ Graph (C).

17 **Answer by yourself.**

Thinking Skills Questions

① 1. 3 2. 14 – 16 3. 1 – 11

② 1. b 2. a 3. b 4. b

③ Because each period starts by filling of new energy level and the number of main energy levels in the heaviest known atoms is 7 till now.

④ a. 12 b. 18

⑤ a. ∵ Element (X) forms with oxygen a compound, its formula is X_2O
∴ The valency of element (X) is monovalent.
∴ The number of electrons in the outermost energy level of its atom = 1 electron.
∴ Element (X) locates in group 1A (1).

b. ∵ The element locates in the third period.
∴ The number of energy levels occupied by electrons in its atom = 3 energy levels.
∴ The atomic number = 2 + 8 + 1 = 11

c. s-block.

Lesson 2

1

1. d	2. b	3. a	4. a	5. c	6. b
7. c	8. d	9. b	10. d	11. d	12. a
13. d	14. a	15. d	16. b	17. c	18. b
19. c	20. d	21. b	22. d	23. b	24. d

2 1. (✓)

2. (✗) .... is smaller than ....

3. (✓)

4. (✗) .... between the two bonded elements is relatively high.

5. (✓)

6. (✗) .... is relatively high.

7. (✗) .... nearest preceding inert gas.
8. (✗) .... and a neon atom (Ne) ....
9. (✗) .... carries two positive charges.
10. (✗) .... a strong metal.
11. (✓)
12. (✗) .... the metallic property decreases.
13. (✓)
14. (✗) .... and (H_2) gas evolves.
15. (✓)
16. (✗) .... in a descending order ....
17. (✗) Carbonic acid is ....
18. (✓)
19. (✗) Copper and silver ....
20. (✗) .... forming alkaline solutions.
21. (✗) .... gives (CO_2) gas ....
22. (✓)
23. (✗) Some bases .... forming alkalis.

3

1. Picometre. 2. Electronegativity.
3. Polar compounds. 4. Water.
5. Metals. 6. Positive ion.
7. Nonmetals. 8. Negative ion.
9. Neon gas. 10. Metalloids.
11. Group (7A). 12. Litmus solution.
13. Basic oxides. 14. Alkalis.
15. Amphoteric oxides.
16. Chemical activity series.
17. Acids. 18. Acidic oxides.

4

1. atomic radius – picometre.
2. decrease
3. increases – energy levels.
4. greater – smaller
5. Electronegativity – electrons
6. Water – ammonia
7. more – electronegativity – greater
8. metalloids – noble gases.
9. less – more 10. gain – negative ion.
11. two – positive – two
12. positive – positive charges
13. negative – electrons.
14. Metalloids
15. decreases – increases.
16. a strong metallic element – a noble gas.
17. cesium. 18. increases.
19. salts of acids – hydrogen
20. alkaline solutions – blue.
21. descending – chemical activity
22. Iron – copper 23. Carbon
24. basic – acidic 25. acidic solutions – red.

5

1. $2Mg + O_2 \xrightarrow{\Delta} 2MgO$
2. $MgO + H_2O \longrightarrow Mg(OH)_2$
3. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2 \uparrow$
4. $C + O_2 \xrightarrow{\Delta} CO_2$
5. $CO_2 + H_2O \longrightarrow H_2CO_3$

6

Element	Its electronic configuration	Its kind	Formula of its oxide	Type of its oxide
1. $_{11}Na$	(+11) K L M: 2 8 1	Metal	Na_2O	Basic oxide
2. $_{12}Mg$	(+12) K L M: 2 8 2	Metal	MgO	Basic oxide
3. $_6C$	(+6) K L: 2 4	Nonmetal	CO_2	Acidic oxide

7

1. Due to the increase of the attraction force between the positive nucleus and the negative electrons in the outermost energy level.
2. Because by increasing the atomic number in the same group, the number of energy levels occupied by electrons increases.
3. Because the difference in electronegativity between its elements is relatively high.
4. Because the difference in electronegativity between oxygen and hydrogen in water molecule is greater than the difference between nitrogen and hydrogen in ammonia molecule.
5. Because the difference in electronegativity between its elements is relatively high.
6. Because ($_{11}Na$) is a metal element, so it tends to lose its outermost electron and changes into a positive ion (Na^+).
7. Because ($_{17}Cl$) is a nonmetal element, so it tends to gain one electron and changes into a negative ion (Cl^-).

8. Because during the chemical reaction, sodium atom ($_{11}Na$) loses one electron and fluorine atom ($_9F$) gains one electron so, the number of electrons becomes 10 electrons in each of the two ions.
9. Due to increasing their atomic sizes, so the ability to lose the outermost electron increases.
10. Because it has the largest atomic size, so it can lose its valency electron easily.
11. Because magnesium oxide is a basic oxide which dissolves in water forming magnesium hydroxide (alkaline solution) which turns litmus solution into blue.
$MgO + H_2O \longrightarrow Mg(OH)_2$
12. Because potassium is a very active metal, while copper is inactive metal according to their chemical activity.
13. Because carbon dioxide is an acidic oxide which dissolves in water forming carbonic acid (acidic solution) which turns litmus solution into red.
$CO_2 + H_2O \longrightarrow H_2CO_3$
14. Because it reacts with acids as a basic oxide and it reacts with bases as an acidic oxide giving in the two cases salt and water.

8

1. It is the ability of the atom in a covalent molecule to attract the electrons of the chemical bond towards itself.
2. They are covalent compounds in which the difference in electronegativity between their elements is relatively high.
3. They are the elements which have less than four electrons in their outermost energy levels.
4. They are the elements which have more than four electrons in their outermost energy levels.
5. An atom of a metallic element which lost one electron or more during the chemical reaction.
6. An atom of a nonmetallic element which gained one electron or more during the chemical reaction.
7. They are the elements which have the properties of both metals and nonmetals.
8. It is the arrangement of metals in a descending order according to the degree of their chemical activity.
9. They are metallic oxides, some of them dissolve in water forming alkaline solutions.
10. They are nonmetallic oxides which dissolve in water forming acidic solutions.

9

1. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$
2. $2Mg + O_2 \xrightarrow{\Delta} 2MgO$
3. $MgO + H_2O \longrightarrow Mg(OH)_2$
4. $C + O_2 \xrightarrow{\Delta} CO_2$
5. $CO_2 + H_2O \longrightarrow H_2CO_3$

10

1. $_{13}Al < _{12}Mg < _{11}Na < _{19}K$
2. $_3Li < _{11}Na < _{19}K < _{55}Cs$
3. $Cu < Zn < Mg < K$

11

1. - By adding water to each of them.
   - With sodium: It reacts instantly with water and hydrogen gas evolves which burns with a pop sound.
   - With iron: It reacts at high temperatures with hot water vapour only.
2. - By adding water and drops of violet litmus solution :
   - With magnesium oxide, litmus solution turns into blue.
   - With sulphur oxide, litmus solution turns into red.

12

Odd word (or symbol)	Scientific term of others
1. Cl^-	Their electronic configuration is similar to that of neon.
2. Bromine	Metalloids.
3. Silver	Elements react with water.
4. CO_2	Basic oxides.

13

1. The atomic size increases.
2. It changes into a positive ion.
3. It changes into a negative ion.
4. The atomic number increases then the atomic size increases, so the metallic property increases and the nonmetallic property decreases.
5. Magnesium chloride is formed and hydrogen gas evolves.
$Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$
6. It burns with a bright light and changes into powder (magnesium oxide).
$2Mg + O_2 \xrightarrow{\Delta} 2MgO$
7. It dissolves in water forming magnesium hydroxide.
$MgO + H_2O \longrightarrow Mg(OH)_2$

8. Carbon dioxide gas is formed.

$$C + O_2 \xrightarrow{\Delta} CO_2$$

9. The solution turns into blue.
10. The solution turns into red.
11. It dissolves forming carbonic acid solution.

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

14 1.

Period elements	Group elements
- They are different in properties.	- They are similar in properties.
- They are similar in the number of energy levels occupied by electrons.	- They are similar in the number of electrons in the outermost energy level.
- They are different in the number of electrons in the outermost energy level.	- They are different in the number of energy levels occupied by electrons.
By increasing their atomic numbers : • Atomic size decreases. • Metallic property decreases till we reach metalloid, then nonmetallic property increases and ends with an inert gas.	**By increasing their atomic numbers :** • Atomic size increases. • Metallic property increases "in groups which start with a metallic element".

2. ***Look at the main book on page (42).***
3. ***Look at the main book on page (51).***
4. ***Look at the main book on page (51).***
5.

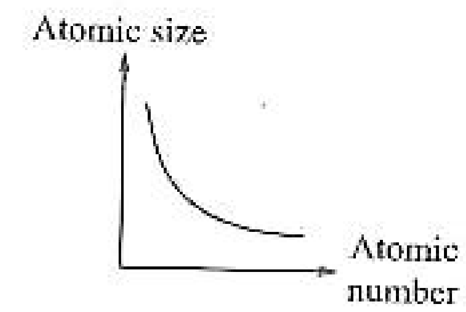
P.O.C.	Sodium	Silver
The reaction with water :	It reacts instantly with water and hydrogen gas evolves which burns with a pop sound.	It doesn't react with water.

6.

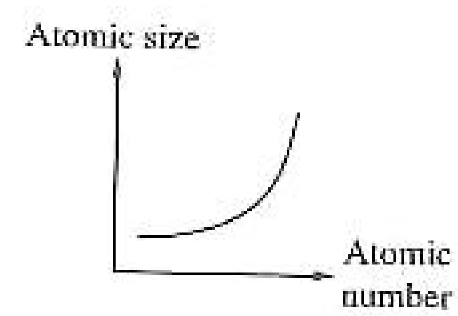
P.O.C.	Magnesium oxide	Carbon dioxide
• Type of oxide :	Basic oxide	Acidic oxide
• The reaction with water :	It dissolves in water forming magnesium hydroxide (alkaline solution) which turns litmus solution into blue. $MgO + H_2O \longrightarrow Mg(OH)_2$	It dissolves in water forming carbonic acid (acidic solution) which turns litmus solution into red. $CO_2 + H_2O \longrightarrow H_2CO_3$

15 1. Iron reacts at high temperatures with hot water vapour only.
2. Silver doesn't react with water.
3. Potassium reacts instantly with water and hydrogen gas evolves which burns with a pop sound.

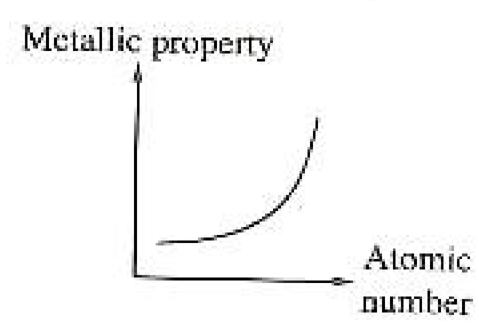
16 1. Inverse relation.



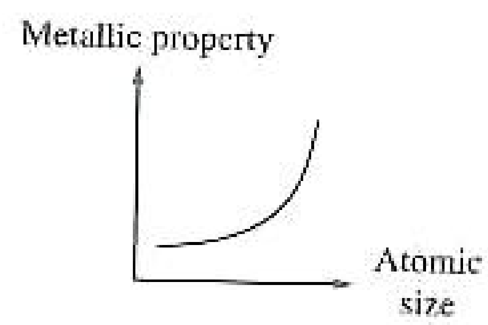
2. Direct relation.



3. Direct relation.



4. Direct relation.



17 ① 1. * The name of (A) is magnesium oxide and its chemical formula is MgO
* The name of (B) is magnesium hydroxide and its chemical formula is $Mg(OH)_2$
2. It turns the litmus solution into blue.
3. Basic oxide.

② 1. $_{11}X$ 2. $_{12}Z$ 3. $_{12}Z$

③ 1. $_{9}Y$ 2. $_{11}Z$

④ 1. ($_{11}Na$) and ($_{13}Al$) belong to period (3) but ($_{6}C$) belongs to period (2).
2. ($_{11}Na$) locates in group (1A).
($_{13}Al$) locates in group (3A).
($_{6}C$) locates in group (4A).
3. * Sodium oxide is a basic oxide.
* Aluminium oxide is an amphoteric oxide.
* Carbon dioxide is an acidic oxide.
4. a. Sodium oxide forms an alkaline solution.
b. Carbon dioxide forms an acidic solution.

⑤ 1. $MgO + H_2O \longrightarrow Mg(OH)_2$
Alkaline solution

2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$
Metal chloride

⑥ *Look at the main book on page (49).*

18 ① 1. Fig. (C) 2. Fig. (B) 3. Fig. (A)

② 1. $_{19}K$ 2. $_8O$

③ 1. Hydrogen gas, by approaching a burning match to it, it burns with a pop sound.

2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

④ Fig. (C)

Thinking Skills Questions

① 1. d 2. c 3. d 4. d

② a. - Blue litmus paper changes into red, because CO_2 gas dissolves in water forming carbonic acid.

- Red litmus paper doesn't change.

b. $CO_2 + H_2O \longrightarrow H_2CO_3$

Lesson 3

1

1. b	2. a	3. c	4. b	5. a
6. c	7. b	8. c	9. a	10. d
11. d	12. b	13. d	14. c	15. c
16. b	17. b	18. b	19. c	20. a
21. b	22. a	23. b	24. b	25. c
26. a	27. b	28. a	29. c	30. c
31. d				

2

1. (✗) .... one positive charge.
2. (✗) Sodium and potassium............
3. (✗) Cesium is ....
4. (✓)
5. (✓)
6. (✓)
7. (✓)
8. (✓)
9. (✗) .... , while iodine exists in a solid state.
10. (✓)
11. (✗) .... with potassium iodide.
12. (✗) Elements of group (17) ....
13. (✗) .... p-block groups.
14. (✗) Cobalt 60 is ....
15. (✓)
16. (✗) Liquefied nitrogen ....
17. (✗) Silicon slides ....

3

1. Group (1A). 2. Alkali metals.
3. Positive ions. 4. Cesium.
5. Group 7A (17). 6. Halogens.
7. Iodine. 8. Bromine.
9. Liquid sodium. 10. Cobalt 60
11. Silicon. 12. Liquefied nitrogen.

4

1. alkali metals – s 2. the left side
3. Sodium – potassium 4. water – alkaline
5. monovalent.
6. valency – positive – one
7. active – kerosene – paraffin oil.
8. kerosene – moist air.
9. atomic number – atomic size
10. Cesium – atomic size. 11. Sodium
12. heat – electricity. 13. float – smaller
14. sink – greater
15. sodium hydroxide (alkaline solution) – hydrogen
16. stronger – more 17. halogens.
18. p – right – inert
19. monovalent – gain – negative
20. one – seven 21. gaseous – solid
22. diatomic – two 23. bromine – iodine
24. potassium bromide – iodine.
25. Cobalt 60 – gamma

5

1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$
2. $2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$
3. $2K + Br_2 \longrightarrow 2KBr$
4. $2Na + Cl_2 \longrightarrow 2NaCl$
5. $2NaBr + Cl_2 \longrightarrow 2NaCl + Br_2$
6. $Br_2 + 2KI \longrightarrow 2KBr + I_2$
7. $Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$

6

Element	Symbol	Type	Use
1. Nitrogen	N	Nonmetal	Its liquid state is used in preservation of cornea of the eye.
2. Silicon	Si	Metalloid	Silicon slides are used in the manufacture of electronic devices.
3. Radioactive cobalt 60	Co	Transition element	It is used in food preservation.
4. Sodium	Na	Metal	Its liquid state is used in transferring heat from inside the nuclear reactor to outside, to be used to obtain the vapour energy required to generate electricity.

7

1. Because they react with water forming alkaline solutions.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

2. To prevent it from the reaction with moist air as it is an active metal.
3. Because it has the lowest atomic size in group (1A) and the chemical activity increases as the atomic size increases.
4. Because the density of lithium is smaller than water density, while the density of cesium is greater than water density.
5. Because potassium is more chemically active than sodium, where the atomic size of potassium is greater than the atomic size of sodium.
6. Because sodium reacts instantly with water and hydrogen gas evolves which burns with a pop sound.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

7. Because it has the largest atomic size, so it can lose its valency electron easily.
8. Because they tend to lose their valency electron during chemical reactions forming positive ions and each of them carries one positive charge.
9. Because they react with metals forming salts.

$2K + Br_2 \longrightarrow 2KBr$

10. Because they are chemically active elements.
11. Because bromine is less active than chlorine.
12. Because alkali metals lose one electron during the chemical reaction and change into positive ions, and halogens gain one electron during the chemical reaction and change into negative ions.
13. Because it is a good conductor of heat, where it transfers heat from inside the nuclear reactor to outside. This heat is used to obtain the vapour energy required to generate electricity.
14. Because it emits gamma rays which prevent the reproduction of microbial cells without an effect on human.
15. Because silicon is a semi-conductor which its ability to conduct electricity depends on temperature.
16. Due to the decrease of its boiling point (–196°C).

8

1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$
2. $2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$
3. $2Na + Cl_2 \longrightarrow 2NaCl$
4. $2K + Br_2 \longrightarrow 2KBr$
5. $Br_2 + 2NaI \longrightarrow 2NaBr + I_2$
6. $Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$
7. $Cl_2 + 2KI \longrightarrow 2KCl + I_2$
8. $Cl_2 + 2NaBr \longrightarrow 2NaCl + Br_2$

9

1. It is used in transferring heat from inside the nuclear reactor to outside, this heat is used to obtain the vapour energy required to generate electricity.
2. It is used in food preservation, because it emits gamma rays which prevent the reproduction of microbial cells without an effect on human.
3. It is used in preservation of cornea of the eye, due to the decrease of its boiling point (–196°C).
4. Silicon slides are used in the manufacture of electronic devices such as computer, because silicon is a semi-conductor which its ability to conduct electricity depends on temperature.

10

Odd word (or symbol)	Scientific term of the rest
1. Helium	Alkali metals.
2. O_2	Halogens.
3. Chlorine	Inert gases.

11 1.

P.O.C.	Alkali metals group	Halogens group
Group no.	(1) 1A	(17) 7A
Position :	On the maximum left side of the periodic table.	On the right side of the periodic table.
Block belongs to it :	s-block	p-block
Kind of their elements :	Metals	Nonmetals
Connecting their elements to electricity and heat :	Good conductors of heat and electricity.	Bad conductors of heat and electricity.

2.

P.O.C.	Chlorine	Bromine
The physical state :	Gas	Liquid
Chemical activity :	More active than bromine.	Less active than chlorine.

3.

Fluorine	Helium
- It belongs to halogens group (17) 7A	- It belongs to inert gases group (18) 0
- The outermost energy level of its atom contains 7 electrons.	- The outermost energy level of its atom contains 2 electrons.
- It locates in period (2).	- It locates in period (1).
- An active element.	- An inert gas.
- Its molecule consists of two atoms.	- Its molecule consists of one atom.

12

① 1. Lithium < Sodium < Rubidium < Cesium

2. Li < K < Na < Rb < Cs

② By putting a small piece of sodium in water, hydrogen gas evolves which burns with a pop sound.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

③ ***Look at the main book on pages (65 & 66).***

④ ***Answer by yourself.***

⑤ 1. X 2. Z 3. Y

⑥ 1. $_{17}Y$ 2. $_{11}X$ 3. $_{11}X$

4. $_{14}Z$ 5. $_{11}X$, $_{17}Y$

⑦ 1. Z 2. X

13

① 1. Alkali metals – (1) 1A

2. • A : Lithium (Li)

D : Rubidium (Rb).

• The element D sinks in water, because its density is greater than the density of water ($1\ gm/cm^3$).

② 1. Alkali metals – Monovalent.

2. **Answer by yourself.**

3. ∵ Element (Y) locates in the third period and group 1 (1A).

∴ Element (Z) locates in the fourth period and group 1 (1A).

∴ The atomic number of element (Z) $= 2 + 8 + 8 + 1 = 19$

4. (a) X (b) M

③ 1. Hydrogen gas.

2. An alkaline solution – it turns violet litmus solution into blue.

3. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

④ 1. Potassium. 2. Potassium hydroxide.

3. Because its density is less than the density of water.

4. The speed of the reaction increases.

5. Potassium sinks in kerosene and it prevents potassium to react with moist air.

⑤ (a) N and O (b) A and B

(c) L and M (d) B (e) L

⑥ 1. • X is an alkali metal.

• M is a transition element.

• D is an inert gas.

2. 8

3. (a) E, The name of the group is alkali metals group.

(b) C

⑦ 1. (a) D (b) F

2. Letter "A" represents "Na" element, so the chemical equation of reaction of (Na) with water is :

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

3. (a) two atoms. (b) monovalent – monovalent.

4. As (A) refers to an element from alkali metal group, so the type of oxide is "Basic oxide".

5. Because element (D) is a halogen which has 7 electron in the outermost energy level, so it needs for one electron to reach to stability form, so (D) is found in diatomic state.

∴ Letter D refers to element (Cl), so its physical state is a gas

14

Because the density of lithium is less than the density of kerosene, so it floats on its surface. At the same time, the density of lithium is more than the density of paraffin oil, so it sinks in it and it is isolated from moist air and doesn't react with it.

Thinking Skills Questions

① 1. b   2. b   3. c

② a. • Atomic number of (X) is 11
- Block of (X) is s-block.
- Atomic number of (Y) is 17
- Block of (Y) is p-block.

b. Salt – (NaCl)

c. No, because both of them are metals.

③ a. ∵ Element (M) reacts with water forming a compound, its formula (MOH)
∴ The valency of element (M) is monovalent.

b. ∵ Element (M) is a monovalent metal.
∴ The number of electrons in the outermost energy level in its atom = 1 electron.
∵ Element (M) locates in period (3).
∴ No. of energy levels occupied with electrons in its atom = 3 energy levels.
∴ The atomic number of element (M) = 2 + 8 + 1 = 11

c. s-block.

d. Hydrogen gas.

e. Basic oxide.

④ 1. No, because each of them locates in group (1A) and the properties of the same group are similar.

2. No, because fluorine is a nonmetal belongs to halogens group that its atoms tend to gain one electron during the chemical reaction forming negative ions, each of them carries one negative charge.

Lesson 4

1

1. c	2. c	3. c	4. a
5. d	6. b	7. c	8. d
9. d	10. a	11. d	12. c
13. c	14. d	15. b	16. a
17. c	18. b	19. c	20. b
21. a	22. c	23. a	24. c
25. b			

2 1. a   2. d   3. c

3 1. (✗) .... one oxygen atom and two hydrogen atoms.
2. (✗) .... by hydrogen bonds.
3. (✗) .... two single covalent bonds.
4. (✓)   5. (✓)   6. (✓)
7. (✗) .... decreases on freezing.
8. (✗) ...... hexagonal shape and large volume.
9. (✓)   10. (✓)
11. (✗) .... at the anode .... at the cathode.
12. (✗) .... water electrolysis.
13. (✗) .... natural environmental pollutants.
14. (✗) Biological pollution ....
15. (✗) .... of lead ....
16. (✗) .... chemical water pollution.

4
1. Water molecule.   2. Single covalent bond.
3. Hydrogen bond.   4. Water.
5. Hofmann's voltameter.   6. Anode.
7. Oxygen gas.   8. Cathode.
9. Hydrogen gas.   10. Water pollution.
11. Natural environmental pollutants.
12. Artificial environmental pollutants.
13. Biological water pollution.
14. Chemical water pollution.
15. Lead.   16. Mercury.
17. Arsenic.   18. Thermal water pollution.
19. Radiant water pollution.

5
1. agricultural fields – industrial fields – personal fields.
2. oxygen – hydrogen
3. hydrogen – electronegativity
4. single covalent – hydrogen
5. solvent – ionic   6. Table salt – sugar
7. oil – hydrogen   8. 100°C – 0°C
9. hydrogen
10. decreases – increases.
11. 4°C – hydrogen   12. hexagonal – volume.
13. neutral
14. Hofmann's voltameter – electric
15. anode – cathode.   16. oxygen – hydrogen
17. hydrogen – 14   18. natural – artificial
19. biological – thermal – radiant
20. bilharzia – hepatitis.
21. lead – brain   22. blindness – liver cancer.
23. biological – radiant
24. factories – sewage
25. Thermal – temperature

26. purification – drinking water tanks
27. plastic – chlorine – cancer.

6

Origin of water pollution	Kind of pollution	Harms
1. Discharging factories wastes and sewage in seas and rivers.	**Chemical** pollution.	• Blindness. • **Liver cancer.** • **Death of brain cells.**
2. **Mixing animals and human wastes with water.**	Biological pollution.	• **Bilharzia.** • Typhoid. • **Hepatitis.**
3. **Dumping the atomic wastes in the oceans and seas.**	Radiant pollution.	——
4. Using of water of some marine zones for cooling the nuclear reactors.	**Thermal** pollution.	**Death of marine creatures.**

7

1. Due to the presence of hydrogen bonds between water molecules.
2. Due to the higher electronegativity of oxygen compared with hydrogen.
3. Because water is a good polar solvent for most ionic compounds (as table salt).
4. Because water is a good polar solvent.
5. Because sugar molecules can form hydrogen bonds with water molecules.
6. Because it is a covalent compound which cannot form hydrogen bonds with water.
7. Because when the temperature of water becomes less than 4°C, water molecules are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them, so its volume increases and thus its density decreases.
8. Because the density of ice is less than the water density.
9. Because the density of ice is less than that of water at 4°C
10. Due to formation of a layer of ice on the surface of liquid water protects the deep water from freezing which preserves the life of the marine organisms in it.
11. Because when water freezes, its volume increases.
12. Because pure water has a neutral effect on litmus paper dye.
13. To make water conduct electricity, where pure water is a bad conductor of electricity.
14. Because oxygen gas evolves at the anode, that increases the glowing of splint.
15. Because biological water pollution causes the infection with many diseases such as : bilharzia, typhoid and hepatitis.
16. Because chemical water pollution causes dangerous diseases such as the death of brain cells, blindness and liver cancer.
17. Because this leads to death of brain cells.
18. Because this leads to the separation of the dissolved oxygen in water.
19. Because plastic reacts with chlorine gas which is used as water disinfectant, leading to the increase in the infection rates by cancer.

8

1. It is a type of weak electrostatic attraction that originates between the molecules of some polar compounds.
2. It is the addition of any substance to the water which causes continuous gradual change in water properties affecting the health and the life of living creatures.

9

1. The abnormality of water properties such as : rising of its boiling and freezing points and decreasing its density on freezing.
2. The water molecules are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them so, its volume increases and thus its density decreases.
3. It will be exploded because when water freezes its volume increases.
4. - The acidified water decomposes into hydrogen gas evolves at the cathode and oxygen gas evolves at the anode.
   - The ratio between the produced hydrogen gas and oxygen gas is about (2 : 1) by volume respectively.
5. It causes biological pollution of water which causes the infection by many diseases such as bilharzia, typhoid and hepatitis.
6. It causes the death of brain cells.

7. It causes blindness.
8. It increases the infection rate by liver cancer.
9. Radiant water pollution occurs.
10. Plastic reacts with chlorine gas which is used as water disinfectant leading to the increase in the infection rates of cancer.

10
1. This leads to biological water pollution.
2. This leads to chemical water pollution.
3. This leads to thermal water pollution which causes death of marine creatures.

11 1.

P.O.C.	Table salt	Food oil
• **Type of the compound :**	Ionic.	Covalent.
• **Dissolving in water :**	Dissolves in water.	Doesn't dissolve in water.

2.

P.O.C.	Bonds between atoms of water molecule	Bonds between water molecules
• **Type :**	Single covalent bonds.	Hydrogen bonds.
• **Strength :**	Stronger than the hydrogen bonds.	Weaker than the covalent bonds.

3. • **Pure water :** It is a bad conductor of electricity.
   • **Acidified water :** It is a good conductor of electricity.
4. *Look at the main book on page (91).*
5. *Look at the main book on page (92).*
6. *Look at the main book on page (92).*

12
1. It is very important for survival of all living organisms and it is used in :
   • Agricultural fields.
   • Industrial fields.
   • Personal fields.
2. It is used for electrolysis of water to its elements.

13 *Look at the main book on page (92).*

14 ① *Look at the main book on page (85).*

② - The density of water in solid state (ice) is lower than its density in liquid state.
- The maximum density of pure water is at 4°C and the lowest density of water, when it is ice 0°C.

③ By adding violet litmus solution :

Bottle (1)	Bottle (2)	Bottle (3)
The solution turns into red.	The solution turns into blue.	No change occurs.

④ • $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$
• $2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$

⑤ *Look at the main book on page (93).*

15 *Look at the main book on page (89).*

16 ① 1. At point (A) = 0°C
At point (B) = 4°C
2. At point (B).

② 1. $2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$
2. volume of hydrogen = 12 cm^3
3. a. Hydrogen gas.
b. Oxygen gas.

③ 1. (X) oxygen gas – (Y) hydrogen gas.
2. Volume of oxygen = 4 cm^3.

④ 1. Hofmann's voltameter – It is used for electrolysis of water to its elements.
2. (1) Acidified water. (2) Oxygen gas.
(3) Hydrogen gas. (4) Anode.
(5) Cathode.
3. $2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$
4. * Above the anode: it glows more.
* Above the cathode: it burns with a pop sound.
5. Volume of oxygen gas = 10 cm^3.

⑤ 1. No, because pure water is a bad conductor of electricity.
2. The lamp illuminates, because sodium carbonate makes water conducts electricity.

17 It may be expected to increase pollution of the Nile as a result of human and industrial activities, or decrease the rate of pollution in case of the development of environmental awareness among members of society and the development of legal controls.

Thinking Skills Questions

① 1. a 2. c 3. c 4. c 5. b

② a. (1) Sodium hydroxide and hydrogen gas.

(2) carbonic acid

(3) Magnesium hydroxide.

b. (2) Acidic solution. (3) Alkaline solution.

c. It changes the colour of litmus paper into blue, because it is an alkaline solution.

d. (1) gas (A) : Hydrogen gas.

gas (B) : Oxygen gas.

(2) Hofmann's voltameter.

③ 1. Bond (X) is a hydrogen bond.
Bond (Y) is a single covalent bond.

2. (Y) Covalent bond is stronger than (X) hydrogen bond.

3. (X) Hydrogen bond.

4. (a) water (b) 104.5°

④ 1. Its boiling and its freezing points decrease, and its density increases on freezing.

2. Water will freeze in these regions, so the aquatic organisms that live in these areas will freeze which leads to destroy them.

Unit Two

Lesson 1

1

1. a	2. c	3. a	4. a	5. b
6. a	7. a	8. c	9. b	10. d
11. a	12. b	13. c	14. b	15. a
16. d	17. c	18. d	19. b	20. c
21. c	22. c	23. c	24. d	25. d

2

① 1. d 2. a 3. b 4. c

② 1. b 2. d 3. c 4. a

3

1. (✓)
2. (✗) .... the weight ....
3. (✓) 4. (✓)
5. (✗) .... decreases ....
6. (✓) 7. (✓) 8. (✓)
9. (✗) .... and mesosphere.
10. (✗) .... troposphere layer.
11. (✗) .... is 13 kilometres.
12. (✗) Troposphere layer ....
13. (✗) .... decreases ....
14. (✗) .... lower part of stratosphere.
15. (✗) Mesosphere is ....
16. (✗) .... in stratosphere layer.
17. (✓) 18. (✓) 19. (✓)
20. (✓) 21. (✓)
22. (✗) .... as exosphere. 23. (✓)

4

1. Atmospheric air (envelope).
2. Atmospheric pressure. 3. Bar or millibar.
4. Normal atmospheric pressure.
5. Barometer. 6. Aneroid.
7. Altimeter. 8. Isobar.
9. Tropopause. 10. Stratopause.
11. Mesopause. 12. Troposphere.
13. Stratosphere. 14. Mesosphere.
15. Thermosphere. 16. Ionosphere.
17. Van-Allen Belts.
18. Aurora phenomenon. 19. Exosphere.

5

1. gaseous – atmospheric envelope.
2. atmospheric pressure.
3. the atmospheric pressure.
4. 1000 5. 1013.25
6. Aneroid – altimeter 7. increases
8. decreases – decreases.
9. 3 – 90 10. less

11. high – low
12. four – troposphere – thermosphere.
13. tropopause – mesopause
14. Troposphere – 13 km.
15. 6.5 – 1 km
16. 100 mbar – (- 60°C)
17. 75 – 99
18. vertical – upward – downward.
19. stratosphere – ozonic
20. 37
21. (- 60) – 0
22. ozone – ultraviolet
23. decreases – 0.001
24. lower – clouds
25. ozone – 20 – 40
26. mesosphere – 35 km.
27. decreases – (- 90°C)
28. hydrogen – helium
29. thermosphere – thermal
30. increases – 1200
31. ionosphere – 700
32. thermosphere – mesosphere.
33. Van-Allen – Earth.
34. Aurora – poles
35. troposphere – exosphere

6

Atmospheric layer	Order	Thickness	Temperature at its top
1. Stratosphere	The second	37 km	0°C
2. Thermosphere	The fourth	590 km	1200°C
3. Mesosphere	The third	35 km	– 90°C
4. Troposphere	The first	13 km	– 60°C

7

1. Due to decreasing the height of air column and thus its weight decreases.
2. Due to the difference in the length of air column from an area to another on the Earth's surface.
3. Because it is used by pilots in aeroplanes to determine their elevations above sea level.
4. Due to the difference in atmospheric pressure from a region to another on the Earth's surface, where winds move from regions of high atmospheric pressure to that of low atmospheric pressure.
5. Because all atmospheric turbulences take place in it.
6. Because in troposphere layer, the temperature decreases as we go up by a rate (6.5°C) for each 1 km height.
7. Because it contains about 75% of the mass of atmospheric envelope.
8. Because it contains 99% of atmospheric water vapour.
9. Because the hot air currents (less density) move upwards, while cold air currents (high density) move downwards.
10. Because it contains most of ozone gas (O_3) which is found in atmospheric envelope.
11. This is due to the absorption of ultraviolet rays (emitted from the Sun) by ozone layer, which is present at its upper part.
12. Because in this part, the air movement is horizontally and neither clouds nor weather turbulences exist.
13. Because it is the middle layer.
14. Because the temperature in this layer decreases with a high rate as we go up until it reaches (– 90°C) at its top.
15. Because it contains a limited amount of helium and hydrogen gases only.
16. Due to burning of this celestial rocky masses as a result of their friction with air molecules.
17. Because it is the hottest layer in atmospheric envelope.
18. Because it contains charged ions.
19. Because it reflects radio waves transmitted by radio stations and communication centres.
20. Because they scatter the harmful charged cosmic radiations away from the Earth.
21. Due to scattering of harmful charged cosmic radiations away from the Earth by Van-Allen Belts.

8

1. It is a gaseous envelope surrounding the Earth that rotates with Earth around its axis and extends about 1000 km above sea level.
2. It is the weight of air column of an atmospheric height on a unit area ($1m^2$).
3. It is the atmospheric pressure at sea level.
4. Curved lines that join the points of equal pressure in atmospheric pressure maps.
5. It is the region between troposphere and stratosphere.
6. It is the region between stratosphere and mesosphere.
7. It is the region between mesosphere and thermosphere.
8. They are two magnetic belts surrounding ionosphere.
9. It is a phenomenon appears as brightly coloured light curtains at the two poles of the Earth.
10. It is a region in which the atmospheric envelope is inserted in outer space.

11. It is a layer that contains charged ion and it exists in the upper part of thermosphere and extends up to 700 km above sea level.

9

1. They are used to measure the atmospheric pressure.
2. It is used by pilots in aeroplanes to determine their altitude above sea level.
3. It is used to determine the possible day weather.
4. It is used to join the points of equal pressure in atmospheric pressure maps.
5. It organizes the Earth's temperature.
6. It is a suitable region for flying aeroplanes.
7. It protects the planet Earth from celestial rocky masses that enter the atmospheric envelope by formation of meteors.
8. It is important in wireless communications and broadcasting.
9. They play an important role in scattering of harmful charged cosmic radiations away from the Earth.
10. They transmit weather conditions information and TV programs.
11. It is suitable for the satellites to orbit around the Earth.

10

1. 1000 km.
2. 1013.25 mbar.
3. 99%
4. 37 km.
5. 0°C
6. 20 km.
7. 0.01 mbar.
8. 1200°C
9. 700 km above sea level.

11

1. The pressure on the diving person increases, because the total pressure on him equals the sum of both the normal atmospheric pressure and the water pressure.
2. The temperature decreases with a rate 6.5°C for each 1 km height and the atmospheric pressure decreases.
3. The temperature decreases and the atmospheric pressure increases.
4. They burn forming meteors.
5. The cosmic radiations are scattered which lead to the occurrence of Aurora phenomenon.

12

1. *Look at the main book on page (111).*
2. *Look at the main book on page (122).*
3. **Tropopause :** It locates between troposphere and stratosphere layers.
   Stratopause : It locates between stratosphere and mesosphere layers.
4.

P.O.C.	Ionosphere layer	Exosphere layer
Definition :	It is a layer that contains charged ions, and it exists in the upper part of thermosphere and extends up to 700 km above sea level.	It is a region in which the atmospheric envelope is inserted in outer space.
Importance :	It is very important in wireless communications and broadcasting.	In which, satellites orbit around the Earth.

5. *Look at the main book on page (122).*

13

1. Height (km) = 10000 ÷ 1000 = 10 km
   The decrease in temperature
   = Height (km) × 6.5 °C = 10 × 6.5
   = 65°C
   The temperature at this height = temperature at the sea level – the decrease in temperature
   = 24 – 65 = – 41°C
2. The decrease in temperature
   = Height (km) × 6.5°C
   = 13 × 6.5 = 84.5°C
   The temperature at the top of troposphere
   = temperature at sea level – the decrease in temperature = 24.5 – 84.5 = – 60°C
3. The amount of change in temperature
   = temperature at its foot – temperature at its top
   = 30 – (– 6) = 36 °C
   The height of the mountain
   $= \frac{\text{The change in temperature}}{6.5°C} = \frac{36}{6.5} = 5.53$ km.
4. a- The decrease in temp. (A : B)
   = Height × 6.5°C = 1 × 6.5 = 6.5°C
   The temp. at point (B) = 26.5 – 6.5 = 20°C
   b- Depth in km = 500 ÷ 1000 = 0.5 km
   The height (C : B) = 1 + 0.5 = 1.5 km
   ∴ The increase in temp. (C : B)
   = Height (km) × 6.5°C = 1.5 × 6.5 = 9.75°C
   The temp. at point (c)
   = 10.25 + 9.75 = 20°C

14 ① Troposphere – Stratosphere – Mesosphere – Thermosphere.

②

Altitude above sea level	3 km	6 km	9 km	12 km
Temperature at this height	4.5°C	– 15°C	– 34.5°C	– 54°C
Atmospheric pressure	731 mbar	503 mbar	323 mbar	203 mbar

③ - At the lower part of stratosphere layer.
- Because at its beginning the atmospheric pressure is 100 mbar and it decreases as we go up until it becomes 1 mbar at its top.

④ *Look at the main book on page (110).*

⑤ 1. Aurora phenomenon.
2. Due to scattering of harmful charged cosmic radiations away from the Earth by Van-Allen Belts.
3. At the two poles of the Earth.

15 ① 1. a. Altimeter. b. Aneroid.
2. *Look at the main book on page (111).*

② 1. isobar.
2. the centre of high atmospheric pressure areas -the centre of low atmospheric pressure areas.
3. The wind moves from H to L.

③ The amount of change in temperature
= 19.25 – 3 = 16.25°C
∴ The height of the aeroplane from the surface of the Earth = $\frac{16.25}{6.5}$ = 2.5 km
∴ The height of the building
= 2.5 – 2 = 0.5 km = 500 m.

④ 1. (A) Thermosphere layer.
(B) Mesosphere layer.
(C) Stratopause.
(D) Stratosphere layer.
(E) Troposphere layer.
2. a. Thermosphere layer.
b. Mesosphere layer.

⑤ 1. a. Troposphere layer.
b. Stratosphere layer.
2. a. 0°C , (– 60°C)
b. 0°C , (– 90°C)

⑥ a. 1. Van-Allen Belts.
2. They surround the ionosphere layer.
b. Aurora phenomenon.

Thinking Skills Questions

① 1. b 2. d 3. a 4. b 5. a

② a. Air will not transfer from any place to another on the Earth's surface, and no wind will be formed.
b. Radio stations and communication centres can't transmit radio waves.

③ ∵ Snow is formed at a temperature = Zero°C
∴ The amount of decrease in temperature
= 26 – Zero = 26°C
∴ The height = $\frac{26}{6.5}$ = 4 km
∴ The snow begins to appear at 4 km.

④ - Difference in height between (A) and (B)
= 10 – 8 = 2 km.
- Difference in temperature between (A) and (B)
= 2 × 6.5 = 13°C

⑤ - Height of this point = 13 – 5 = 8 km
- Decrease in temperature
= 8 × 6.5 = 52°C
- Temperature at this point
= 24.5 – 52 = – 27.5°C

⑥ a. The difference in temperature
= zero – (– 90) = 90°C
b. ∵ The height of troposphere layer is 13 km.
∵ The amount of increase in temperature
= 13 × 6.5 = 84.5°C
∴ The temperature (X)
= (– 60) + 84.5 = 24.5°C

Lesson 2

1

1. b	2. c	3. c	4. c	5. b
6. c	7. c	8. b	9. a	10. c
11. c	12. c	13. b	14. d	15. d
16. d	17. b	18. d	19. a	20. c
21. b	22. b	23. b	24. c	25. d
26. a	27. a			

2 ① 1. b 2. d 3. e 4. a
② 1. b 2. d 3. a
③ 1. c 2. a 3. f 4. b 5. d

3 1. (✓)
2. (✗) .... three oxygen atoms.
3. (✗) .... to 40 km ....
4. (✗) .... oxygen molecule into ....
5. (✗) Dobson is ....
6. (✗) Nanometre (nm) = 1 × 10^{-9} m.
7. (✗) .... all near ultraviolet rays and 5% of medium ultraviolet rays.

8. (✓) 9. (✓) 10. (✓)
11. (✓) 12. (✓)
13. (✗) Nitrogen oxides ....
14. (✓) 15. (✓) 16. (✓)
17. (✗) .... its long wavelength.
18. (✓) 19. (✓) 20. (✓)
21. (✓)

4

1. Ozone gas.
2. Oxygen gas.
3. Ultraviolet radiation.
4. Stratosphere layer.
5. Dobson.
6. Ozone layer.
7. Far ultraviolet rays.
8. Medium ultraviolet rays.
9. Near ultraviolet rays.
10. Far and medium ultraviolet rays.
11. Ozone hole.
12. Chlorofluorocarbon compound (freon).
13. Methyl bromide gas.
14. Halons.
15. Nitrogen oxides.
16. Global warming phenomenon.
17. Greenhouse gases.
18. Carbon dioxide gas.
19. Infrared radiation.
20. Greenhouse effect.

5

1. Erosion of ozone layer – global warming phenomenon
2. 20 – 40
3. oxygen – 20
4. Ozone molecule
5. (a) O (b) O_2
6. 3 – 300
7. near – medium – far
8. 1×10^{-9}
9. near – medium
10. south – September
11. freon – air conditioning sets.
12. CFC_S – halons
13. Methyl bromide gas
14. Nitrogen
15. fossil fuel – forests fires.
16. carbon dioxide (CO_2) – methane gas (CH_4)
17. visible light – short-waved
18. Infrared – a long
19. chemical – thermal
20. Melting the snow of two poles – severe climatic changes
21. Forests fires – drought waves

6

1. Because it is the first layer in the atmospheric envelope which contains suitable amount of oxygen gas, faces ultraviolet radiations emitted from the Sun.
2. Because it doesn't allow penetration of all far and most of medium ultraviolet radiations which have harmful chemical effects and threaten the life of living organisms.
3. Due to increasing the amount of pollutants which are emitted at this time every year.
4. Because they cause erosion of ozone layer and global warming phenomenon.
5. To reduce the use of chlorofluorocarbon compounds as they are used in making foam backing.
6. Because freon causes erosion of ozone layer and global warming phenomenon.
7. Because their exhausts contain nitrogen oxides that cause erosion of the ozone layer.
8. Due to increasing of greenhouse gases in the atmosphere.
9. Due to fossil fuel burning, cutting trees and forests fires.
10. Because it has a long wavelength.
11. Because the Earth's atmosphere resembles the role of glass in greenhouse as it prevents penetration of infrared radiation causing increasing of Earth's temperature.
12. Because it causes melting of the snow of both south and north poles and also it causes severe climatic changes.
13. To prevent increasing the percentage of CO_2 gas which increases the temperature of planet Earth.

7

1. It is the measuring unit of ozone degree.
2. It means standard temperature and pressure i.e. it is the normal atmospheric pressure at 0°C temperature.
3. Thinning or losing parts of ozone layer above the south pole.
4. Chlorofluorocarbon compounds.
5. Intergovernmental Panel on Climate Changes.
6. It is an increase in the average temperature of the Earth's near-surface air.
7. **Answer by yourself.**
8. It is the trapping of infrared radiation in the troposphere layer due to the increase in the percentage of greenhouse gases which cause the increase in the planet Earth's temperature.

8
1. Ozone molecule.
2. The wavelength of medium ultraviolet rays.
3. Nanometre.
4. Ozone layer.
5. The normal degree of ozone.

9
1. It helps in the formation of ozone gas molecules.
2. It acts as a protective shield for living organisms against the harmful chemical effects of ultraviolet radiations.

3 : 5 *Look at the main book on page (138).*

10
1. Chlorofluorocarbon compounds (CFC_S).
2. Carbon dioxide gas.
3. Tropical hurricanes, such as hurricane Katrina in 2005.

11
1. *Look at the main book on page (135).*
2. Increase of CO_2 in air causes the increase in the temperature of near-surface air of planet Earth.
3. Trapping of infrared radiation in the troposphere layer increases the temperature of near-surface air of planet Earth.

12

Odd word	Scientific term
1. Water vapour.	- Pollutants of ozone layer.
2. Extinguishing fires.	- Uses of freon.
3. Methyl bromide	- Greenhouse gases.
4. Greenhouse effect	- Severe climatic changes.

13
1. The bond between oxygen molecule is broken down giving two free oxygen atoms (2O).
2. Ozone molecule is formed.
3. The thickness of ozone layer will be 3 mm only.
4. , 5. & 6. Erosion of ozone layer increases and also the temperature of the Earth increases.
7. Medium and far UV rays penetrate ozone layer and cause harmful effects.
8. Increasing the temperature of near-surface air of planet Earth.
9. Occurrence of greenhouse effect phenomenon which causes the increase in the planet Earth's temperature.
10. The level of seas and oceans would increase and therefore :
    - Disappearance of some coastal areas.
    - Extinction of some polar animals like the polar bear and seals.
11. Tropical hurricanes, destroying floods, drought waves and forest fires take place.
12. The percentage of CO_2 gas increases in the atmospheric air by a continuous way which leads to occurrence of greenhouse effect phenomenon.

14
1.

Points of comparison	Oxygen molecule	Ozone molecule
Structure :	It consists of two oxygen atoms.	It consists of three oxygen atoms.
The effect of ultraviolet radiations on each of them :	They break down the bond in oxygen molecule to give two free oxygen atoms (2O).	The ozone molecule absorbs the harmful ultraviolet radiations, while it permits the passage of the useful ultraviolet radiations.

2.

Points of comparison	Far ultraviolet radiations	Near ultraviolet radiations
The percentage which penetrates ozone layer :	0%	100%
The wavelength :	100 : 280 nm	315 : 400 nm

3.

Points of comparison	Greenhouse effect	Ozone hole
Causes :	Increasing the percentage of greenhouse gases in the atmosphere, such as : water vapour (H_2O) and Nitrous oxide (N_2O).	The atmosphere contains compounds that pollute the ozone layer such as : chlorofluorocarbon, methyl bromide gas, halons and nitrogen oxides.
Harms :	Increasing the temperature of the near-surface air of planet Earth which leads to global warming phenomenon.	Penetration of harmful ultraviolet rays to the Earth's surface which threaten living organisms by their chemical effects.

15
① 1. 20 km. 2. Oxygen element.
3. a. ultraviolet b. 3 mm.
4. (✗).

② $O_2 \xrightarrow{UV} O + O$

$O_2 + O \longrightarrow O_3$

③ 1. CFC_S compounds, methyl bromide gas, halons and nitrogen oxides.

2. Freon. 3. Nitrogen oxides.

4. The ozone layer can be protected by the following ways :

- The use of chlorofluorocarbon compounds must be reduced and find safer alternatives.
- Stop producing the ultrasound concorde planes as their nitrogen oxides affect the ozone layer.

④ 1. Global warming phenomenon.

2. Occurrence of greenhouse effect as a result of increasing the percentage of greenhouse gases.

3. Melting of polar ice would increase the level of seas and oceans and causes extinction of some polar animals like polar bear and seals.

⑤ 1. *Look at the main book on pages (142 & 143).*

2. *Look at the main book on page (141).*

⑥ Degree of erosion of ozone layer = 300 – 255 = 45 Dobson

The percentage of erosion of ozone layer

$= \frac{45}{300} \times 100 = 15\%$

⑦ 1. *Look at the main book on page (143)*

2. The increasing of the temperature of the near-surface air of planet Earth as a result of the global warming phenomenon.

16 ① 1. Fig. (c) 2. Fig. (b) 3. Fig. (a)

② 1. (1) Near ultraviolet rays.

(2) Medium ultraviolet rays.

(3) Far ultraviolet rays.

2. Rays no. (1).

3. (A) : ozone layer / 20 km / stratosphere layer.

4. Chlorofluorocarbon compounds, methyl bromide gas, halons and nitrogen oxides.

③ 1. Carbon dioxide gas (CO_2).

2. Bottle (2), due to increasing the percentage of carbon dioxide gas which resembles greenhouse effect.

④ 1. Area (B), because the percentage of carbon dioxide gas in it is lower than area (A).

2. Global warming phenomenon.

⑤ 1. Greenhouse effect.

2. When the percentage of greenhouse gases increases in the atmosphere, greenhouse effect occurs (the temperature of the Earth increases) leading to the global warming phenomenon.

3. Infrared radiation.

Thinking Skills Questions

① When the green plants make photosynthesis process, this leads to decreasing the percentage of carbon dioxide gas in the atmosphere which reduces the greenhouse effect and thus lowering the occurrence of global warming phenomenon.

② a. 100 %

b. As it has a longer wavelength than medium and far UV.

③ 75

④ (d)

⑤ 1. (A) Visible rays and short-waved rays.

(B) Infrared radiation.

2. Greenhouse effect.

Unit Three

Lesson 1

1

1. b 2. b 3. b 4. b 5. b
6. a 7. c 8. c 9. a 10. b
11. d 12. b 13. a 14. b 15. b
16. b 17. c 18. a 19. d 20. d
21. c 22. b 23. c 24. d 25. c
26. a

2

① 1. c 2. b 3. e

② 1. e 2. d 3. f 4. a

3

1. during its life 2. mammoth
3. snow. 4. resinous
5. mold 6. cast
7. fossils. 8. petrified
9. Index 10. coral
11. Nummulites
12. a hot and rainy tropical environment.
13. fish 14. Archaeopteryx
15. radiolaria

4

1. Fossils. 2. Trace. 3. Remains.
4. A complete body fossil.
5. Amber. 6. Mold.
7. Cast. 8. Petrified woods.
9. Petrification. 10. Index fossils.
11. Fossil record.

5

1. old living – sedimentary
2. Traces – remains
3. Dinosaur's foot print – worms' tunnels
4. Shark's teeth – dinosaur's skull
5. formation.
6. mold – cast – petrified fossils.
7. snow.
8. mammoth – snow
9. Pine – amber – decomposition.
10. Ammonites fossil – nummulites fossil
11. Fish cast – cast of ferns
12. solid mold – cast. 13. a solid mold
14. Silica – petrified 15. organic – shape
16. Petrified wood – petrified dinosaur's eggs
17. wood mountain – petrified woods
18. life evolution – paleoenvironment.
19. Index – sedimentary
20. nummulites – limestone
21. a hot – tropical 22. clear – shallow
23. sea – land. 24. Algae – angiosperms
25. Fish – amphibians. 26. birds – reptiles.
27. reptiles – birds.
28. petroleum – sedimentary rocks.

6

1. Because when it died , it was rapidly buried in snow which preserved it from decomposition.
2. Because it preserved the bodies of insects inside it from decomposition.
3. Because it is a replica of the internal details of the snail of ammonites.
4. Due to replacing the organic matter of wood by minerals part by part.
5. Because it contains petrified woods which look like rocks.
6. Because they give us the details about the life of an old plant.
7. Due to the presence of nummulites fossils in the limestone rocks of El-Mokattam mountain.
8. Because they indicate the age of sedimentary rocks, as the age of rocks is the same age of fossils existed in them.
9. Because the index fossils are the fossils of living organisms that lived for a short period of time in the past and had a wide geographic distribution, then became extinct and these conditions are not available in all fossils.
10. Because the presence of foraminifera and radiolaria in the rocks of the exploratory wells indicate the suitable conditions of petroleum formation.

7

1. They are traces and remains of old living organisms that are preserved in sedimentary rocks.
2. It is the traces of an old living organism that indicate its activity during its life.
3. They are the traces that indicate the remains of an old living organism after death.
4. It is a fossil that keeps the whole shape and all the details of the body of the living organism as a result of its rapid burying as soon as it died in a medium that preserves it from decomposition.
5. It is the solidified resinous matter which was secreted by pine trees in old geologic ages.

6. It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks.
7. It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks.
8. They are fossils in which minerals replace the organic matter of an old living organism, after its death, part by part leaving the shape without any change.
9. They are fossils which are formed as a result of replacing the wood material of trees with minerals such as silica, part by part, giving us details about the life of an old plant.
10. It is the process of conversion of the parts of old living organisms to rocky materials as a result of replacing the organic material of the organism with minerals, part by part.
11. They are the fossils of organisms that had lived for a short period of time in the past and had a wide geographical range distribution, then became extinct.
12. The sequence of fossils in sedimentary rocks layers according to their sequence of appearance from simple to complicated.

8

1. Dinosaur's foot print.
2. Remains of shark's teeth.
3. Mammoth fossil.
4. Fish cast.
5. Ammonites fossil.
6. Petrified dinosaur's eggs.
7. Nummulites fossils.
8. Archaeopteryx.
9. Radiolaria.

9

1. They help in :
   - Age determination of sedimentary rocks.
   - Figuring out the paleoenvironment.
   - Studying life evolution.
   - Petroleum exploration.
2. They indicate the age of sedimentary rocks in which they are found.
3. They indicate that the area of El-Mokattam mountain was a sea floor more than 35 million years ago.
4. They indicate that the environment where they lived was clear, warm and shallow seas.
5. They indicate that the environment where they lived was a hot and rainy tropical environment.
6. Its study indicates the sequence of appearance of living organisms from simple to complicated according to the sequence of appearance of their fossils in sedimentary rocks layers.
7. They indicate :
   - The age of rocks existed in exploratory wells.
   - The suitable conditions of petroleum formation.

10

1.

Trace	Remains
It is the traces indicate the activity of an old living organism during its life. Ex. : Traces of worm's tunnels.	They are the traces indicate the remains of an old living organism after death. Ex. : Remains of dinosaur's skull.

2. *Look at the main book on page (160).*

3.

A cast	A mold
It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks. Ex. : Fish cast.	It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks. Ex. : Trilobite fossil.

4.

A cast	A trace
It is the replica of the external details of the structure of an old living organism leaving them in the sedimentary rocks after death. Ex. : Fish cast.	It is the traces that indicate the activity of an old living organism leaving them in sedimentary rocks during its life. Ex. : Dinosaur's foot print.

5. *Look at the main book on page (164).*

6.

Coral fossils	Ferns fossils
They indicate that the environment where they lived was clear warm shallow seas.	They indicate that the environment where they lived was a hot and rainy tropical environment.

7.

Nummulites fossil	Foraminifera fossil
It indicates that the area of El-Mokattam mountain was a sea floor more than 35 million years ago.	It indicates : - The age of rocks existed in the exploratory wells. - The suitable conditions of petroleum formation.

11

Odd word	Suitable name
1. Fossil record.	Types of fossils.
2. Fossil of ferns.	Solid mold fossils.
3. Nummulites fossil.	Petrified fossils.
4. Petrified fossils.	Importance of fossils.

12

1. A complete body fossil of it is formed.
2. The bodies of insects are preserved inside it from decomposition.
3. A solid mold fossil for snail is formed which carries the internal details of its structure.
4. A cast of shell is formed carrying the external details of its shell.
5. It changes into petrified wood.

13

1. The presence of nummulites fossils in the limestone rocks of El-Mokattam mountain.
2. • Algae appeared before mosses & ferns.
   • Gymnosperms appeared before angiosperms.
   • Invertebrates appeared before vertebrates.
3. The environment contains coral fossils.
4. The environment contains ferns fossils.
5. The rocks samples contain the microfossils such as foraminifera and radiolaria.

14

① a. **Fossils :** They are traces and remains of old living organisms that are preserved in sedimentary rocks.
b. **Types of fossils :**
(1) Fossil of complete body.
(2) Mold.
(3) Cast.
(4) Petrified fossils.

② a. Pine trees secrete resinous matter that changed after its solidification into amber.
b. Small organisms [like insects].
c. Because it preserves them in a medium which protects them from decomposition.

③ *Look at the main book on page (162).*

④ a. More than 35 million years.
b. They are fossils because they give us details about the life of an old plant.
c. They were formed by replacing the organic matter of wood by minerals part by part.

⑤ *Look at the main book on page (166).*

⑥ a. Birds and mammals.
b. Amphibians.
c. Archaeopteryx.

⑦ He can conclude that the conditions in this exploratory well are suitable for petroleum formation.

⑧ a. They indicate that the environment where they lived was a hot and rainy tropical environment.
b. They indicate that the environment where they lived was a clear warm shallow seas.
c. They are found in the limestone rocks of El-Mokattam mountain and indicate that there was a sea floor in this area more than 35 million years ago.

⑨ Trilobite – Cast fossil of fish – Crocodiles – Mammoth.

⑩ a, b, c and d : Mold
e : Cast

15

① fig. (a) : Remains of a dinosaur's skull – Remains fossil.
fig. (b) : Traces of worms' tunnels – Trace fossil.
fig. (c) : Shell fossil – Cast fossil.
fig. (d) : Amber fossil – Complete body fossil.
fig. (e) : Ammonites fossil – Solid mold fossil.
fig. (f) : Dinosaur's foot print – Trace fossil.

② 1. fig. (a) : Fossil of ferns cast.
fig. (c) : Fossil of trilobite mold.
2. fig. (b) and (c) : are fossils of solid mold.
3. a hot and rainy tropical environment.

③ 1. fig. (a) : Coral fossil.
fig. (b) : Radiolaria fossil.
fig. (c) : Nummulites fossil.
2. (a) indicates that the area was clear warm shallow seas.
(b) indicates that the area has the suitable conditions of petroleum formation and this fossil indicates the age of rocks existed in exploratory wells.
(c) indicates that the area was a sea floor more than 35 million years ago.
3. It is found in the limestone rocks of El-Mokattam mountain.

16

From the suggested answers :
ice cubes mold, cake mold, jelly mold, ...

Thinking Skills Questions

① 1. (B) 2. (B)

② No, as scientists discover petrified fossil of dinosaur's eggs, so they are not mammals.

③ Because trilobite considered from invertebrates which preceeds mammals in life.

④ Earth worm – shark – frog – snake – horse.

⑤ As fossils found only between the sedimentary rocks.

Lesson 2

1

1. b	2. a	3. d	4. d	5. d
6. c	7. d	8. a	9. b	10. c
11. c	12. b	13. b	14. d	15. b

2 1. d 2. a 3. b 4. e

3 1. c-B 2. e-C 3. b-A 4. a-E

4
1. (✗) Fossils .... 2. (✓)
3. (✗) .... an endangered plant.
4. (✓) 5. (✓) 6. (✓)
7. (✗) .... USA.

5
1. .... is one of the causes of the extinction in recent ages.
2. .... is a simple ecosystem which is strongly affected by the absence of one of its species.
3. .... reduced size wings.
4. Bald eagle ....

6
1. Extinction. 2. Dodo bird.
3. Quagga. 4. Bald eagle.
5. Papyrus plant. 6. Simple ecosystem.
7. Complicated ecosystem.
8. Food chain. 9. Food web.
10. Natural protectorates.
11. Yellowstone protectorate.
12. Ras Mohamed protectorate.
13. Wadi El-Hetan.

7
1. the same species – compensation – die out.
2. Fossils
3. Meteorite impacts with the Earth – exposure of the Earth to long ice age
4. Destroying natural habitat – overhunting – environmental pollution
5. dinosaur – mammoth.
6. Dodo bird – quagga
7. horse – zebra.
8. Bald eagle – ibis bird – rhinoceros – panda bear
9. Papyrus plant – writing paper.
10. energy – food
11. Desert – tropical forest
12. Establishing natural protectorate areas – establishing gene banks for the endangered species
13. Natural protectorate
14. Yellowstone protectorate – panda protectorate
15. Yellowstone protectorate – grey bear.
16. Ras Mohamed
17. Wadi El-Hetan

8
1. Due to : - Meteorite impacts with the Earth.
   - The violent Earth movement.
   - Exposure of the Earth to long ice age.
   - Toxic gases which evolved from volcanoes.
2. Due to : - Destroying natural habitat.
   - Overhunting.
   - Environmental pollution.
   - Climatic changes and natural disasters.
3. Due to the reduced size of its wings, so it is a non-flying bird.
4. Because its head is covered with white feathers which make it looks like bald.
5. & 6. Due to the rarity of alternative that compensates the absence of this species.
7. Because it is a system containing a large number of members of living organisms and it is not affected by the absence of any species.
8. & 9. To protect the rare and endangered living organisms.
10. To protect endangered living organisms in their homeland.
11. Because it protects grey bear from the danger of extinction.
12. Because it contains rare species of coral reefs and coloured fish.
13. Because it contains complete whales' skeleton fossils 40 million years ago.

9
1. It is the continuous decrease without compensation in the number of a certain species of living organisms until all members of species die out.
2. It is a path of energy that transfers from a living organism to another in the ecosystem.
3. It is a group of food chains connected with each other.
4. It is an ecosystem that has a few members and it is strongly affected by the absence of one of its species.
5. It is an ecosystem that has multiple members and it is not affected much by the absence of one of its species.
6. They are safe areas established to protect endangered species in their homeland.

10
1. Dodo bird.
2. Ibis bird.
3. Papyrus plant.
4. Desert.
5. Tropical forest.
6. Yellowstone protectorate.

11 *1. & 2. Look at the main book on page (185).*

12
1. Dodo bird.
2. Quagga.
3. Grey bear.
4. Rare species of coral reefs and coloured fish.
5. Whale.

13 1.

Old extinction	Recent extinction
• Meteorite impacts with Earth. • The violent Earth movements. • Exposure of the Earth to long ice age. • Toxic gases which evolved from volcanoes.	• Destroying natural habitat. • Overhunting. • Environmental pollution. • Climatic changes and natural disasters.

2. *Look at the main book on page (189).*

14
1. It causes a cavity in the path of energy in this ecosystem that would disturb the ecosystem equilibrium or destroy it.
2. It is strongly affected due to the rarity of alternative that compensates this absence.

15
1. Destroying habitat – Causes of old extinction.
2. Quagga – Endangered species.
3. Bald eagle – Extinct species.
4. Giza pyramids area – Natural protectorates.

16
① • Meteorite impacts with the Earth.
• The violent Earth movements.
• Exposure of the Earth to long ice age.
• Toxic gases which evolved from volcanoes.

② *Look at the main book on page (185).*

③ *Look at the main book on page (190).*

④ a. In South Sinai governorate.
b. Because it contains rare species of coral reefs and coloured fish.

⑤ a. In El-Fayoum governorate.
b. The area is Wadi El-Hetan which contains complete whales' skeleton fossils.

⑥ a. It contains rare species of coral reefs and coloured fish.
b. It contains complete whales' skeleton fossils from 40 million years ago.

⑦ a. It is strongly affected, because of the rarity of alternative that compensates this absence.
b. It is not affected much, because it has many alternatives.

17
① a. The food chain destroys and its members die.
b. The number of snakes increases leading to disturbance of the ecosystem equilibrium.
c. The number of frogs increases and eat all locusts leading to disturbance of the ecosystem equilibrium.

② a. Fig. (2)
b. Fig. (2), because it is complicated ecosystem which contains a large number of members of living organisms that compensate the absence of any species.

③ a. Mammoth.
b. Mammoth is an extinct animal.
Reasons of extinction :
1. Meteorite impacts with Earth.
2. The violent Earth movements.
3. Exposure of the Earth to long ice age.
4. Toxic gases which evolved from volcanoes.

④ (1) Dodo bird – Extinct.
(2) Rhinoceros – Endangered.
(3) Panda bear – Endangered.

⑤ a. The figure indicates the archaeopteryx.

b. • It indicates the idea of extinction : because it is not found in the recent age.

• It indicates the idea of evolution : because it is the link between reptiles and birds.

Thinking Skills Questions

① 1. d 2. b

② On land, because it can't fly due to the reduced size of its wings.

③ a. Green plant.

b. Disturbance of the ecosystem, and number of frog decreased due to absence of locusts (their food) which die due to absence of green plant.

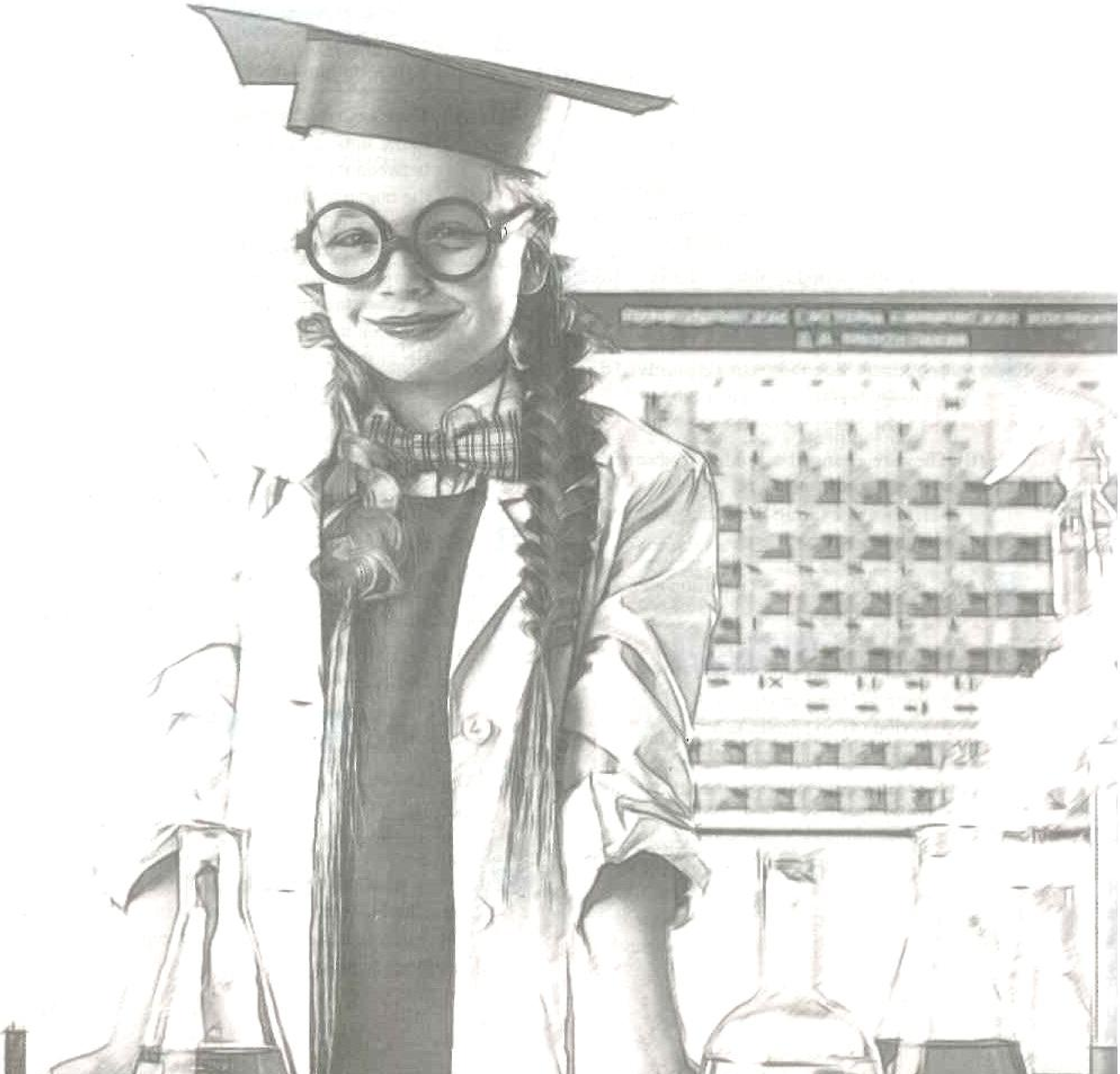
④ (1) a. Some species loss their shelter so, they will be subjected to extinction.

b. O_2 ratio will decrease while the ratio of CO_2 will increase.

(2) Overcutting trees of forests and environmental pollution.

PART 2

Guide Answers of Worksheets



Unit One

Worksheet 1

1 (A) 1. c 2. b 3. a 4. d 5. c 6. b

(B) 1. Mendeleev's periodic table.
2. Moseley's periodic table.
3. Main energy levels.

2 (A) 1. periodically – period.
2. one electron – period.
3. lanthanides – actinides
4. their atomic weights – their atomic numbers.
5. Principles of Chemistry.

(B) *Look at the main book on page (10).*

3 (A) 1. Mendeleev. 2. Moseley. 3. Rutherford.

(B) 1. (✗) .... in vertical groups.
2. (✓) 3. (✓) 4. (✗) Bohr ....

4 (A) In order to facilitate their study and to find a relationship between elements and their physical and chemical properties.

(B) 1. Modern periodic table 2. (7) 3. 118

Worksheet 2

1 (A) 1. 92 2. left side – two
3. energy levels 4. (4)
5. 7 – 18

(B) They are arranged ascendingly according to :
– Their atomic numbers.
– The way of filling their energy sublevels with electrons.

2 (A) 1. p-block. 2. Transition elements.
3. The atomic number.
4. f-block.

(B) 1. Period (3) and group (1A).
2. Period (3) and group (0).
3. Period (4) and group (2A).
4. Period (2) and group (7A).

(C) 1. ∵ Element (X) lies in the third period and group (1A).
∴ The atomic number of element (X) $= 2 + 8 + 1 = 11$
2. (15) 3. (8)

3 (A) 1. c 2. b 3. c 4. c
5. b 6. a 7. b 8. b

(B) 1. a. B b. X c. M
2. A : s-block. B : d-block.
D : p-block.
3. c

4 (A) 1. Atomic number $= 2 + 6 = 8$
2. Atomic number $= 2 + 8 + 1 = 11$
3. Atomic number $= 2 + 8 = 10$

(B) 1. (✗) .... of four blocks of elements.
2. (✗) The group number of ....
3. (✓)

(C) Because their atoms have the same number of electrons in the outermost energy level.

Worksheet 3

1 1. electronegativity. 2. water.
3. top right – bottom left 4. ammonia.

2 (A) 1. Because by increasing the atomic number in the same period, the attraction force between the positive nucleus and the negative electrons in the outermost energy level increases.
2. Due to the increase of the number of energy levels occupied by electrons.
3. Because the difference in electronegativity between its elements is relatively high.
4. Because the difference in electronegativity between oxygen and hydrogen in water molecule is greater than the difference between nitrogen and hydrogen in ammonia molecule.

(B) The atomic size decreases.

3 (A) *Answer by yourself.*

(B) *Look at the main book on page (37).*

4 (A) 1. Picometre. 2. Polar compounds.

(B) 1. (✓)
2. (✗) .... of a metre.

Worksheet 4

1 (A) 1. Metals. 2. Negative ion. 3. Fluorine.

(B) 1. less 2. an inert gas.
3. increases 4. Cesium

2 1. lose – positive ions – electrons.
2. metalloid – metals – nonmetals.
3. decreases – increases. 4. bottom – top
5. a strong metallic

3 (A) 1. c 2. d 3. b 4. a 5. d

(B) Because it has the largest atomic size, so it tend to lose its valency electron easily.

4 (A) 1. They are elements which have more than 4 electrons in their outermost energy levels.
2. This an atom of a metallic element which loses one electron or more during the chemical reaction.
3. They are elements which have the properties of both metals and nonmetals.

(B) 1. a. Fig. (A) b. Fig. (B)
2. Period (3) and group (2A).

Worksheet 5

1 (A) 1. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

2. $2Mg + O_2 \xrightarrow{\Delta} 2MgO$

$MgO + H_2O \longrightarrow Mg(OH)_2$

3. $C + O_2 \xrightarrow{\Delta} CO_2$

(B)

	Copper	Potassium
By adding each of them to water :	It doesn't react with water.	It reacts instantly with water and hydrogen gas evolves which burns with a pop sound.

2 (A) 1. It is the arrangement of metals in a descending order according to the degree of their chemical activity.
2. They are nonmetal oxides which dissolve in water forming acidic solutions.

(B) 1. b 2. d 3. b 4. d

3 (A) 1. alkaline solutions – blue.
2. hydrogen – burns – pop
3. zinc – iron
4. magnesium hydroxide – carbonic acid.
5. metals – nonmetals
6. $CO_2 + H_2O \longrightarrow H_2CO_3$

(B) *Look at the main book on page (51).*

4 (A) 1. (a) carbon dioxide (CO_2).
(b) carbonic acid (H_2CO_3).
2. It turns litmus solution into red.

(B) 1. Magnesium strip burns with a bright light and changes into a powder (magnesium oxide).
2. The solution turns into red.
3. Alkaline solution of magnesium hydroxide is produced.

Worksheet 6

1 (A) 1. a 2. d 3. d 4. b 5. a

(B) 1. Because he predicted the discovery of new elements and determined the values of their atomic weights.
2. Because it is a nonmetal oxide which dissolves in water forming acidic solution which turns litmus solution into red.

2 (A) 1. Rutherford. 2. cesium – fluorine
3. copper – silver

(B) 1. Period (2) and zero group.
2. Period (2) and group (3A).
3. Period (3) and group (4A).
4. Period (2) and group (4A).

3 (A) 1. (✗) .... right side ....
2. (✓)
3. (✗) .... a basic oxide.

(B) 1. It gives nonmetal oxide (acidic oxide) as follows $C + O_2 \xrightarrow{\Delta} CO_2$
2. It changes into a positive ion.

4 (A) 1. (19) 2. (9) 3. (15)

(B) 1. Water. 2. Carbon.
3. Silicon. 4. Potassium.
5. Silver. 6. Magnesium oxide.
7. Carbon dioxide.

Worksheet 7

1 (A) 1. Alkali metals group.
2. Kerosene.

(B) 1. c 2. d 3. c 4. a 5. b

2 1. Because they react with water forming alkaline solutions.
2. To prevent it from the reaction with moist air, as it is an active metal.
3. Because their densities are more than the water density.

4. Because potassium is more active than sodium, as its atomic size is larger than that of sodium.

3 1. floats – smaller 2. lose – positive – one
3. potassium hydroxide (KOH) – hydrogen
4. atomic size

4 1. C 2. E 3. A , B & C 4. A

Worksheet 8

1 (A) 1. (7A). 2. fluorine – chlorine.
3. radioactive cobalt 60
4. electronic devices – preservation of cornea.

(B) 1. Bromine.
2. Gamma rays.

2 (A) 1. Y 2. Z 3. X & Y

(B) 1. It is used in transferring heat from inside the nuclear reactor to outside, to be used to obtain the vapour energy required to generate electricity.
2. It is used in food preservation.

3 (A) 1. (✓) 2. (✓)
3. (✗) Iodine is ....

(B) 1. Because they are active elements.
2. Because they react with metals forming salts.
3. Due to its low boiling point (–196°C).

4 (A) 1. No reaction.
2. $Cl_2 + 2KI \longrightarrow 2KCl + I_2$
3. $2K + Br_2 \longrightarrow 2KBr$

(B) 1. Potassium – Halogens.
2. Sodium – Gaseous elements.

Worksheet 9

1 (A) 1. Cobalt 60 2. salts formations.
3. $CO_2 - SO_2$ 4. group

(B) 1. Silicon. 2. Iodine.

2 (A) 1. preservation of cornea of the eye.
2. diatomic 3. d-block.

(B) 1. Because the atomic size of potassium is larger than that of sodium.
2. Because iodine is less active than bromine.

3 (A) 1. SO_2 2. Iodine.
3. Sulphur.

(B) 1. Atomic size decreases.
2. It sinks in paraffin oil.

4 (A) 1. b 2. a 3. c 4. c 5. d

(B) 1. a. Period (3) and group (2A).
b. s-block.

2. a. ∵ The atomic number of element (X) = 2 + 8 + 2 = 12
∴ The atomic number of element (Y) = 2 + 8 + 3 = 13

b. ∵ Element (X) locates in period (3) and group (2A).
∴ Element (Z) locates in period (4) and group (2A).
∴ The atomic number of element (Z) = 2 + 8 + 8 + 2 = 20

Worksheet 10

1 (A) 1. d 2. b

(B) *Answer by yourself.*

2 (A) 1. polar – ionic 2. solid – liquid
3. two hydrogen – one oxygen
4. hydrogen 5. hydrogen bond.

(B) It is a type of weak electrostatic attraction that originates between the molecules of some polar compounds.

3 (A) The molecules of water are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them, so its volume increases and thus its density decreases.

(B) 1. (✗) Oil and sugar are ....
2. (✓) 3. (✓)

4 (A) 1. Single covalent bond.
2. Hydrogen bond. 3. Anode.

(B) 1. Because its density is less than water density.
2. To make water conduct electricity, where pure water is a bad conductor of electricity.
3. Because on freezing, the volume of water increases.
4. Because sugar molecules can form hydrogen bonds with water molecules.
5. Because it has a neutral effect.

(C) 1. Hofmann's voltameter.

2. (1) Acidified water
   (Water + Drops of dil.H_2SO_4).
   (2) Oxygen gas.
   (3) Hydrogen gas.
3. * Above the anode, it glows more.
   * Above the cathode, it burns with a pop sound.
4. $2H_2O \xrightarrow{\text{Electrolysis}} 2H_2\uparrow + O_2\uparrow$
5. Volume of the gas at the anode = $\frac{20}{2}$
   = 10 cm^3

Worksheet 11

1
1. Plastic reacts with chlorine gas which is used as water disinfectant leading to the increase in the infection rates of cancer.
2. It causes biological water pollution which causes the infection with many diseases such as bilharzia, typhoid and hepatitis.

2
1. bilharzia – typhoid – hepatitis.
2. blindness – liver cancer.
3. disinfect – plastic
4. death of brain cells.
5. radiant – thermal

3 (A) 1. *Look at the main book on page (92).*
2. *Look at the main book on page (93).*

(B) 1. Biological water pollution.
2. Chemical water pollution.
3. Lead.

4 (A) It is the addition of any substance to the water which causes continuous gradual change in water properties affecting the health and the life of living creatures.

(B) 1. (✗) .... from natural environmental pollutants.
2. (✓)
3. (✗) .... infection with cancer.

General Exercise of the School Book on Unit One

1 1. a 2. d 3. d 4. b

2
1. It is the arrangement of metals in a descending order according to the degree of their chemical activity.
2. It is the addition of any substance to the water which causes continuous gradual change in water properties affecting the health and the life of living creatures.
3. They are the elements which have the properties of both metals and nonmetals.

3 – By adding some water and drops of litmus solution to each of them :
- In case of magnesium oxide, the litmus solution turns into blue.
- In case of sulphur oxide, the litmus solution turns into red.

4
1. It is used in preservation of cornea of the eye, due to the decrease of its boiling point (–196°C).
2. It is used in transferring heat from inside the nuclear reactor to outside, to be used to obtain the vapour energy required to generate electricity.
3. It is used in agricultural fields, industrial fields and personal fields.

5
1. Because it emits gamma rays which prevent the reproduction of microbial cells without an effect on human.
2. Because their atoms have the same number of electrons in the outermost energy level.
3. Due to the presence of hydrogen bonds between water molecules.
4. To prevent them from the reaction with moist air as they are active metals.

6
1. This leads to chemical water pollution.
2. This leads to thermal water pollution which causes death of marine creatures exist in water.
3. This leads to biological water pollution.

Model Exam 1 on Unit One

1 (A) 1. c 2. a 3. c 4. d

(B) 1.

N	O	F
70	66	64
P	S	Cl
110	104	99

2. Picometre.

(C) 18

2 (A) 1. bad 2. anode 3. Rutherford
4. Cobalt 60

(B) 1. Chemical activity series.
2. Hydrogen bonds.
3. f-block.
4. Water.

(C) Because when the temperature of water is less than 4°C, the molecules of water are collected together by hydrogen bonds forming large-sized hexagonal ice crystals with many spaces between them, so its volume increases and thus its density decreases.

3 (A) 1. sodium – heat
2. acidic solutions – alkaline solutions.
3. thermal – radiant
4. Sulphur – phosphorus

(B) 1. c 2. d 3. a 4. b

(C) Silicon – Cobalt 60

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓)

(B) 1. Radiant water pollution occurs.
2. No reaction takes place.

(C) Due to the pollution of the river water as a result of :
- Dumping the factories wastes in it.
- Leakage of chemical pesticides that reach it from the soil with sewage.

Model Exam 2 on Unit One

1 (A) 1. (7)
2. chlorine – fluorine – bromine
3. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$
4. anode – cathode

(B) 1. $Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$
2. $C + O_2 \xrightarrow{\Delta} CO_2$

(C) It changes into a positive ion.

2 (A) 1. (✓) 2. (✓) 3. (✓) 4. (✗)

(B) 1. Because it causes the death of brain cells.
2. Because their atoms have the same number of energy levels occupied by electrons, which are 2 energy levels.

(C) Chlorine : Gaseous state.
Bromine : Liquid state.

3 (A) 1. d 2. b 3. c 4. b

(B) 1. third period. 2. s-block.
3. An alkali metal. 4. neon.

(C) *Answer by yourself.*

4 (A) 1. lithium. 2. NaCl
3. acidic oxide. 4. gaseous state

(B) *Answer by yourself.*

(C) 9 – Nonmetal.

Unit Two

Worksheet 12

1 (A) 1. a 2. b 3. a 4. c 5. b 6. b

(B) - Height in kilometres
= 8862 ÷ 1000 = 8.862 km
- The amount of decrease in temp.
= height (km) × 6.5
= 8.862 × 6.5 = 57.6°C
- Temp. at the top of Everest mountain
= temp. at the foot – the amount of decrease in temp.
= 20.6 – 57.6 = –37°C

2 1. Because it contains about 75% of the mass of atmospheric envelope.
2. Because it contains 99% of the total amount of atmospheric water vapour.
3. Due to decreasing the height of air column.
4. Because the hot air currents (less density) move upwards, while the cold air currents (high density) move downwards.

3 1. 13 km. 2. decreases – 6.5°C
3. troposphere layer. 4. 75% – 99%
5. determine the possible day weather.
6. altimeter

4 (A) 1. *Look at the main book on pages (108 & 109).*
2. *Answer by yourself.*

(B) 1. Troposphere – Stratosphere – Mesosphere – Thermosphere.
2. Thermosphere – Mesosphere – Stratosphere – Troposphere.

(C) 1. (✓) 2. (✗) .... 1013.25 mbar.
3. (✓)

Worksheet 13

1 (A) 1. 37 km – 35 km.
2. meteors – air molecules.
3. thermosphere – mesosphere.
4. stratosphere 5. ionosphere.

(B) 1. It is a phenomenon that appears as brightly coloured light curtains seen at both the north and south poles of the Earth.
2. They are two magnetic belts surrounding ionosphere.
3. It is a region in which the atmospheric envelope is inserted in outer space.
4. It is a layer that contains charged ions and it exists in the upper part of thermosphere and extends up to 700 km above sea level.

(C) The cosmic radiations are scattered which lead to the occurrence of Aurora phenomenon.

2 (A) (a) Troposphere. (b) Tropopause.
(c) Stratosphere. (d) Stratopause.
(e) Mesosphere. (f) Thermosphere.

(B) 1. (✓) 2. (✓)
3. (✗) Ionosphere ....
4. (✗) .... stratosphere layer.

(C) 1. ***Answer by yourself.***
2. ***Look at the main book on page (120).***

3 (A) 1. Because in this part, the air motion is horizontally and neither clouds nor weather turbulences exist.
2. Because it reflects radio waves transmitted by radio stations and communication centres.
3. This is due to the absorption of ultraviolet rays (emitted from the Sun) by ozone layer, which is present at its upper part.
4. Because it contains most of ozone gas (O_3) which is found in atmospheric envelope.
5. Because it contains charged ions.

(B) ***Answer by yourself.***

4 (A) 1. They are used to transmit weather condition information and TV programs.
2. It contains ionosphere which is important in wireless communications and broadcasting.

(B) 1. b 2. b 3. d 4. a 5. a

Worksheet 14

1 1. (✓) 2. (✗) 3. (✗) 4. (✓)

2 1. Far ultraviolet radiations. 2. Ozone hole.
3. Ozone gas. 4. Dobson.

3 (A) $O_2 \xrightarrow{UV} O + O$ $\quad O + O_2 \longrightarrow O_3$

(B) 1. This means that the normal atmospheric pressure is 1013.25 mbar at 0°C temperature.
2. ***Look at the main book on page (136).***

4 (A) 1. ultraviolet 2. near ultraviolet rays.
3. 1×10^{-9} 4. September – south

(B) 1. Due to increasing the amount of pollutants which are emitted at this time every year.
2. Because stratosphere layer is the first layer in the atmospheric envelope which contains suitable amount of oxygen gas, faces ultraviolet radiations emitted from the Sun.

Worksheet 15

1 1. • Fossil fuel burning. • Cutting trees.
• Forests fires.
2. They are used in fires extinguishing.

2 (A) The Intergovernmental Panel on Climate Changes.

(B) 1. a 2. b 3. c

3 (A) 1. (1) Near ultraviolet rays.
(2) Medium ultraviolet rays.
(3) Far ultraviolet rays.
2. 20 km.

(B) Erosion of ozone layer increases, and also the temperature of the planet Earth increases.

4 (A) 1. (✗) Halons are .... 2. (✓)
3. (✗) Nitrogen oxides ....

(B) *Look at the main book on pages (138 & 139).*

Worksheet 16

1 (A) 1. Tropical hurricanes, destroying floods, drought waves and forest fires take place.
2. Disappearance of some coastal areas.
3. Erosion of ozone layer increases.
4. Occurrence of greenhouse effect phenomenon which causes the increase in the planet Earth's temperature.

(B) It is the trapping of infrared radiation in the troposphere layer due to the increase in the percentage of greenhouse gases which cause the increase in the planet Earth's temperature.

2 1. forests fires – drought waves
2. chemical – thermal
3. visible light – short-waved
4. the continuous increase in the average temperature of the Earth's near-surface air.

3 (A) 1. Due to global warming phenomenon.
2. Because it has a long wavelength.
3. To prevent increasing the percentage of CO_2 gas which increases the temperature of planet Earth.
4. Due to fossil fuel burning, cutting trees and forests fires.

(B) 1. a 2. a 3. d 4. d
5. a 6. b

General Exercise of the School Book on Unit Two

1 1. Stratopause. 2. Ionosphere. 3. CO_2
4. Far ultraviolet rays.

2 1. thermosphere – mesosphere.
2. troposphere – exosphere
3. chemical – thermal
4. chlorofluorocarbon – halons

3 *Look at the main book on page (135).*

4 - At the lower part of stratosphere layer.
- Because at its beginning the atmospheric pressure is 100 mbar and it decreases as we go up until it becomes 1 mbar at its top.

5 *Look at the main book on page (122).*

6 The amount of change in temperature
= temperature at its foot – temperature at its top
= 30 – (– 6)
= 36°C

$\therefore$ Height of mountain = $\frac{\text{Change in temperature}}{6.5}$

$= \frac{36}{6.5} = 5.53$ km.

Model Exam 1 on Unit Two

1 (A) 1. c 2. c 3. b 4. d

(B) 1. Mesosphere 2. mesosphere
3. Halons 4. Infrared

(C) - The amount of increase in temp. (the middle of the mountain : A) = 1 × 6.5 = 6.5°C
$\therefore$ The temperature at point (A) = zero + 6.5 = 6.5°C

- The amount of decrease in temp. (the middle of the mountain : B) = 1 × 6.5 = 6.5°C
$\therefore$ The temperature at point (B) = zero – 6.5 = – 6.5°C

- The amount of increase in temp. (A : C) = 0.5 × 6.5 = 3.25°C
$\therefore$ The temperature at point (C) = 6.5 + 3.25 = 9.75°C

2 (A) 1. (✓) 2. (✗) 3. (✗) 4. (✗)

(B) 1. Because they scatter the harmful charged cosmic radiations away from the Earth before entering the ionosphere layer.
2. Because it contains charged ions.

(C) It is the continuous increase in the average temperature of the Earth's near-surface air.

3 (A) 1. fossil fuel burning – cutting trees
2. high – low
3. troposphere – stratosphere
4. thermosphere – thermal

(B) 1. The atmospheric pressure decreases.
2. Ozone molecule is formed.

(C) *Answer by yourself.*

4 (A) 1. Ionosphere layer. 2. Aurora phenomenon.
3. Exosphere. 4. Greenhouse effect.

(B)

Oddword	Relation between others
1. Oxygen	- Greenhouse gases.
2. Water vapour	- Pollutants of ozone layer.
3. Greenhouse effect	- Severe climatic changes.
4. Thermosphere	- Regions between atmospheric layers.

(C) The temperature of stratosphere will decrease because the ultraviolet rays will not be absorbed, and the temperature of troposphere will increase because the amount of ultraviolet rays which pass through it will increase.

Model Exam 2 on Unit Two

1 (A) 1. carbon dioxide (CO_2) – methane gas (CH_4)

2. medium ultraviolet rays – near ultraviolet rays

3. Dobson – 3 mm. 4. 20 – 40

(B) 1. Methane gas. 2. Altimeter.

3. Methyl bromide gas. 4. Drought waves.

(C)

Troposphere layer	Mesophere layer
- In which, all atmospheric phenomena take place. - It organizes the Earth's temperature.	It protects the planet Earth from celestial rocky masses that enter the atmospheric envelope, where some of them burn completely forming meteors.

2 (A) 1. c 2. c 3. a 4. d

(B) 1. Far ultraviolet rays. 2. Aneroid.

3. Atmospheric pressure. 4. Isobar.

(C) Because it contains most of ozone gas (O_3), which is formed in atmospheric envelope.

3 (A) 1. greenhouse gases. 2. carbon dioxide

3. 35 km. 4. Ionosphere

(B) 1. The harmful charged cosmic radiations will reach the surface of the Earth which threaten the life of living organisms.

2. Erosion of ozone layer increases, and also the temperature of the Earth increases.

(C) 1. The amount of change in temp. from the middle of the mountain to its top $= 9 - (-4) = 13°C$

- The distance between the middle of the mountain and its top $= \frac{13}{6.5} = 2$ km.

- The height of the mountain = 2 + 2 = 4 km.

2. The amount of increase in temp. from the top of the mountain to its foot $= 4 \times 6.5 = 26°C$

- The temp. at the foot = temp. at the top + the amount of increase in temp. $= -4 + 26 = 22°C$

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✗)

(B) 1. b 2. d 3. a 4. c

(C) - By increasing the height above sea level, the temperature decreases.

- Diagram (b)

Unit Three

Worksheet 17

1 1. c 2. d 3. c 4. c

2 (A) 1.

Mammoth fossil	Amber fossil
Burying of mammoth after death immediately in snow which preserved it from decomposition.	Immersing insects in resinous matter (that was secreted by pine trees) which solidified and preserved the bodies of these insects inside it from decomposition.

2.

Cast	Mold
It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks. Ex. : Fish fossil.	It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks. Ex. : Trilobite fossil.

(B) 1. Mammoth fossil.

2. *Look at the main book on page (166).*

3. Worms' tunnels.

3 (A) Fig. (1) Shell fossil – Cast fossil.
Fig. (2) Ammonites fossil – Solid mold fossil.
Fig. (3) Remains of a dinosaur's skull – Remains fossil.

(B) 1. It is the solidified resinous matter which was secreted by pine trees in old geological ages.
2. It is the process of conversion of the parts of old living organisms to rocky materials as a result of replacing the organic material of the organism with minerals, part by part.
3. They are traces and remains of old living organisms that are preserved in sedimentary rocks.

4 (A) 1. Because they give us the details about the life of an old plant.
2. Because it contains petrified woods which look like rocks.
3. Because it preserves the bodies of insects inside it from decomposition.

(B) 1. snow. 2. a solid mold – internal
3. pine trees 4. sedimentary

Worksheet 18

1 (A) 1. age – petroleum 2. reptiles – birds.
3. life evolution – paleoenvironment.
4. Nummulites – limestone

(B) They are fossils of organisms that had lived for a short period of time in the past and had a wide geographical range distribution, then became extinct.

2 1. fossils. 2. Index 3. Coral
4. a hot and rainy tropical environment.
5. during its life 6. traces

3 (A) 1. Because the presence of them in the rocks of the exploratory wells indicate the suitable conditions of petroleum formation.
2. Due to the presence of nummulites fossils in the limestone rocks of El-Mokattam mountain.

(B) 1. They indicate the age of sedimentary rocks in which they are found.
2. *Look at the main book on page (166).*

4 (A) 1. b 2. c 3. c 4. c
(B) 1. d 2. a 3. b 4. c

Worksheet 19

1 (A) 1. Overhunting 2. Mammoth
3. Quagga 4. Dodo bird

(B) It is the continuous decrease without compensation in the number of a certain species of living organisms until all members of species die out.

2 (A) • Meteorite impacts with Earth.
• The violent Earth movements.
• Exposure of the Earth to long ice age.
• Toxic gases which evolved from volcanoes.

(B) (1) Panda bear – Endangered species.
(2) Dodo bird – Extinct species.
(3) Rhinoceros – Endangered species.
(4) Ibis bird – Endangered species.

3 (A) 1. Papyrus plant – writing paper.
2. Ibis bird – rhinoceros.
3. Dodo bird – quagga
4. dinosaur – mammoth.

(B) 1. (a) Bald eagle. (b) Dodo bird.
2. (a) Endangered. (b) Extinct.

4 (A) Due to the reduced size of its wings, so it is a non-flying bird.

(B) *Answer by yourself.*

Worksheet 20

1 (A) *Look at the main book on page (190).*

(B) 1. Because it has many alternatives.
2. Because it contains a few number of members and it is strongly affected by the absence of one of its species.

2

Complicated ecosystem	Simple ecosystem
It is an ecosystem that has multiple members and it is not affected much by the absence of one of its species.	It is an ecosystem that has a few members and it is strongly affected by the absence of one of its species.

3 (A) (1) Ras Mohamed protectorate – Rare species of coral reefs and coloured fish
(2) Northeastern China – Panda bear
(3) Yellowstone protectorate – USA

(B) 1. (✗) 2. (✓) 3. (✗)

4 (A) 1. They are safe areas established to protect endangered species in their homeland.
2. It is a path of energy that transfers from a living organism to another in the ecosystem.

(B) 1. d 2. c 3. f
4. a 5. e

General Exercise of the School Book on Unit Three

1 1. b 2. c 3. d

2 1. They are traces and remains of old living organisms that are preserved in sedimentary rocks.
2. They are fossils of organisms that had lived in a short period of time in the past and had a wide geographic distribution, then became extinct.
3. They are safe areas established to protect endangered species in their homeland.

3 1. ... preserved in snow.
2. ... in a hot and rainy tropical environment.
3. ... is one of the causes of recent extinction.

4 *Look at the main book on page (190).*

5 1. Because they give us the details about the life of an old plant.
2. Because the presence of foraminifera and radiolaria in the rocks of the exploratory wells indicate the suitable conditions of petroleum formation.
3. Due to the rarity of alternative that compensates the absence of this species.

6 1 , 2 , 3 & 4. Mold.
5. Cast

Model Exam 1 on Unit Three

1 (A) 1. a 2. c 3. d 4. d

(B) 1. Quagga 2. snow.
3. fish. 4. endangered

(C) 1. The number of algae increases leading to disturbance of the ecosystem equilibrium.
2. Simple ecosystem.

2 (A) 1. (✓) 2. (✗) 3. (✗) 4. (✗)

(B) 1. Because it is a suitable medium which preserves body from decomposition.
2. Because it protects panda bear from the danger of extinction.

(C) 1. Destroying natural habitat.
2. Overhunting.
3. Environmental pollution.
4. Climatic changes and natural disasters.

3 (A) 1. Papyrus – endangered
2. Minerals – petrified
3. Dodo bird – quagga 4. mosses – ferns.

(B) 1. A complete body fossil of it is formed.
2. It changes into petrified wood.

(C) They are traces and remains of old living organisms that are preserved in sedimentary rocks.

4 (A) 1. Extinction. 2. Natural protectorates.
3. Index fossils. 4. Solid mold fossil.

(B) 1. Because the oldest layer is on the bottom and the most recently layer is on the top so, the fossil found in layer (A) (top layer) would be the newest.
2. Sedimentary – because fossils are preserved in sedimentary rocks.

(C) 1. Establishing gene banks for the endangered species.
2. Establishing natural protectorate areas.
3. Putting laws which regulate the process of hunting of living organisms especially the rare types.

Model Exam 2 on Unit Three

1 (A) 1. Yellowstone protectorate – grey bear.
2. Mammoth fossil – amber fossil
3. a few members – strongly affected
4. traces – remains

(B) 1. Desert.
2. Panda protectorate.
3. Nummulites fossil.
4. Dodo bird.

(C) *Look at the main book on page (164).*

2 (A) 1. c 2. c 3. d 4. b

(B) 1. The bodies of insects are preserved inside it from decomposition.
2. It is strongly affected due to the rarity of alternative that compensates this absence.

(C) - (A) Foraminifera.
- (B) Radiolaria.
- They indicate that :
  - The age of rocks existed in exploratory wells.
  - The suitable conditions of petroleum formation.

3 (A) 1. Panda bear 2. birds and mammals.
3. minerals 4. Quagga

(B) 1. Because the presence of foraminifera and radiolaria in the rocks of the exploratory wells indicate the suitable conditions of petroleum formation.
2. To protect the rare and endangered living organisms.

(C) It is the traces of an old living organism that indicate its activity during its life.

4 (A) 1. (✗) 2. (✓) 3. (✓) 4. (✗)

(B) 1. Locust and deer.
2. There will be more frogs, so they will eat more locusts and there will be fewer locusts to eat the grass, so the equilibrium of the ecosystem will disturb.

(C) 1. Ras Mohamed protectorate.
2. Wadi El-Raiyan protectorate.

October Tests

Model 1

1 (A) 1. a 2. b 3. b 4. c

(B) Because they react with water forming alkaline solutions.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2 \uparrow$

2 (A) 1. (✓)
2. (✗) Mendeleev's periodic table is ....
3. (✗) Copper and silver ....
4. (✓)

(B) It dissolves in water forming magnesium hydroxide.

$MgO + H_2O \longrightarrow Mg(OH)_2$

Model 2

1 (A) 1. Acidic oxides.
2. Moseley's periodic table.
3. Electronegativity. 4. Picometre.

(B) Due to the similarity in their properties.

2 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓)

(B) 1. Hydrogen gas, by approaching a burning match to it, it burns with a pop sound.
2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2 \uparrow$

November Tests

Model 1

1 (A) 1. d 2. a 3. a 4. d

(B) Due to the presence of hydrogen bonds between water molecules.

2 (A) 1. (✓) 2. (✗) 3. (✗) 4. (✓)

(B) Erosion of ozone layer increases and also the temperature of the Earth increases.

Model 2

1 (A) 1. Anode.

2. Aurora phenomenon.
3. Chloroflurocarbon compound (freon).
4. Altimeter.

(B) Due to decreasing the height of air column.

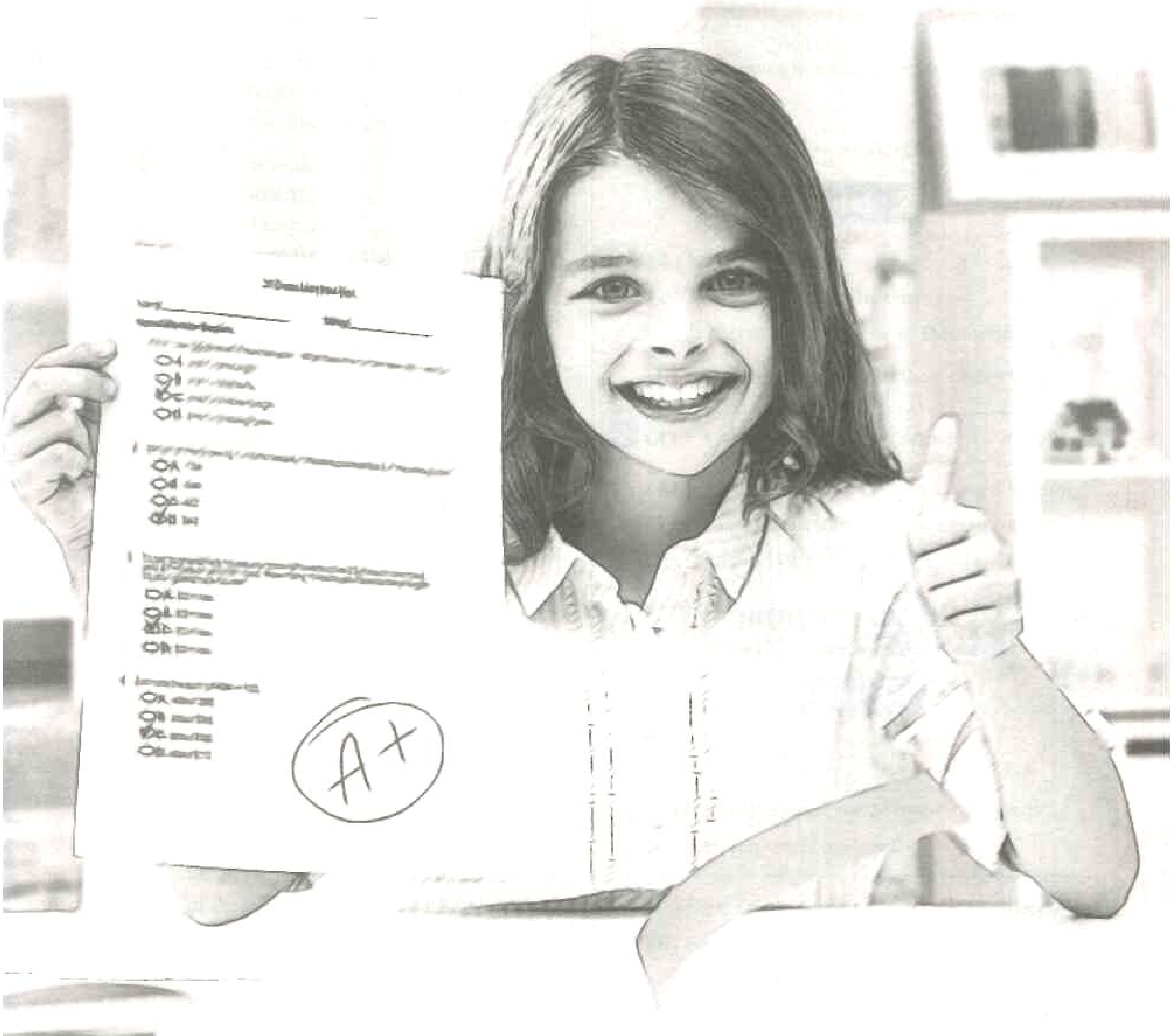
2 (A) 1. 75 – 99

2. south – September
3. less
4. blindness – liver cancer.

(B) Plastic reacts with chlorine gas (which is used as water disinfectant) leading to the increase in the infection rates of cancer.

PART 3

Guide Answers of Final Examinations



Guide Answers of Final Examinations

2024

Cairo Governorate

1 Heliopolis Educational Zone

1 (A) 1. b 2. d 3. d 4. b

(B) 1. Electronegativity. 2. Ozone molecule.
3. Mendeleev's periodic table.

(C) ∵ The volume of hydrogen gas
= 2 × volume of oxygen gas.
∴ Volume of oxygen gas = $\frac{24}{2}$ = 12 cm^3.

2 (A) 1. 3 – 2A
2. mammoth fossil – dinosaur's tooth
3. Mesosphere – thermosphere
4. mercury – lead

(B)

Odd word	Scientific name
1. Neon	Metalloids
2. Oxygen	Greenhouse gases.
3. Sodium	Halogens.

(C)

Mold fossil	Cast fossil
It is the replica of the internal details of the structure of an old living organism left after its death in sedimentary rocks.	It is the replica of the external details of the structure of an old living organism left after its death in sedimentary rocks.

3 (A) 1. stratosphere. 2. Cesium
3. Liquefied nitrogen
4. meteorite impacts with the Earth.

(B) 1. Potassium (19) > Calcium (20) > Lithium (3) > Fluorine (9).
2. Thermosphere – Mesosphere – Stratosphere – Troposphere.
3. Fluorine > Chlorine > Bromine > Iodine.

(C) Because sugar molecules can make hydrogen bonds with water molecules.

4 (A) 1. (✗) The scientist Rutherford .... 2. (✓)
3. (✗) .... was clear warm shallow seas.
4. (✗) It is not prefer to use concorde airplanes as they pollute the ozone layer.

(B) 1. Water molecule.
2. Foraminifera fossil.
3. Bar or Millibar.

(C) It is strongly affected due to the rarity of alternative that compensates this disappearance.

2 El-Nozha Educational Zone

1 (A) 1. b 2. b 3. c 4. c

(B) 1. Silver. 2. CO_2
3. Water vapour.

(C) Electronegativity.

2 (A) 1. minerals.
2. hydrogen gas and oxygen gas
3. Mendeleev 4. Mesosphere

(B) 1. Infrared 2. Halogens
3. Ammonia

(C) Due to the reduced size of its wings, so it is a non-flying bird.

3 (A) 1. b 2. a 3. c

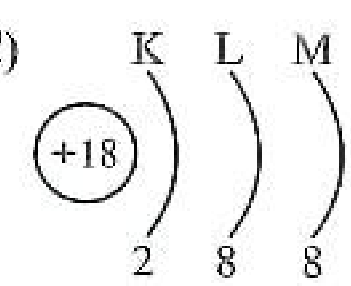
(B) 1. Silver < Zinc < Calcium < Sodium.
2. Tropopause – Stratopause – Mesopause.
3. Fish – Reptiles – Mammals.

(C) The volume of the evolved gas at the anode
= $\frac{20}{2}$ = 10 cm^3 (Oxygen gas).

4 (A) 1. (✗) 2. (✗) 3. (✗) 4. (✓)

(B) 1. They play an important role in scattering harmful charged cosmic radiations away from the Earth.
2. They preserve the fossils of old living organisms.
3. It is used in electrolysis of water to its elements.

(C)



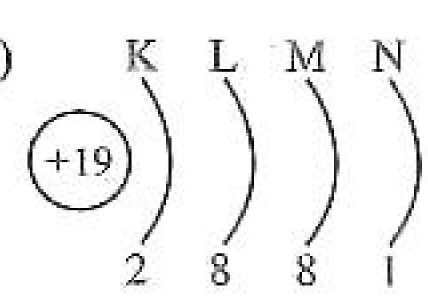
- Period (3)
- Group (0)

3 Manart Al-Salam School

1 (A) 1. Electronegativity. 2. Water pollution.
3. Ionosphere layer. 4. Fossils.

(B) 1. Bromine 2. d-block.
3. dobson.

(C)



- Period (4)
- Group (1A)
- Alkali metal

Part 3

2 (A) 1. b 2. a 3. c 4. a

(B) 1. O_2 2. Al_2O_3 3. Chlorine.

(C) It causes a cavity in the path of energy in this ecosystem that would disturb the ecosystem equilibrium or destroy it.

---

3 (A) 1. (✓) 2. (✗) 3. (✗) 4. (✗)

(B) 1. $C + O_2 \xrightarrow{\Delta} CO_2$

2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

3. $2H_2O \xrightarrow{Electrolysis} 2H_2\uparrow + O_2\uparrow$

(C)

Mendeleev's periodic table	Moseley's periodic table
Elements are classified in an ascending order according to their atomic weights.	Elements are classified in an ascending order according to their atomic numbers.

---

4 (A) 1. b 2. d 3. a 4. c

(B) 1. Due to the presence of hydrogen bonds between water molecules.

2. Due to the rarity of alternative that compensates the absence of this species.

3. Because they scatter the harmful charged cosmic radiations away from the Earth.

(C) – The amount of change in temperature

= Temperature at its foot – temperature at its top

$= 20 - (-6) = 26°C.$

– The height of the mountain

$= \frac{\text{The amount of change in temp.}}{6.5}$

$= \frac{26}{6.5} = 4$ km.

4 Leader Language School

1 (A) 1. c 2. a 3. d 4. b

(B) 1. Liquefied nitrogen. 2. Van-Allen belts. 3. Fossils.

(C) Ibis bird.

---

2 (A) 1. Mesosphere 2. 10 3. Extinction 4. atomic size

(B) 1. plastic 2. Cesium 3. atomic numbers

(C) Due to increasing the amount of pollutants which are emitted at this time every year.

---

3 (A) 1. metalloids. 2. Dodo bird 3. Radiolaria 4. Index

(B) 1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

2. $2H_2O \xrightarrow{Electrolysis} 2H_2\uparrow + O_2\uparrow$

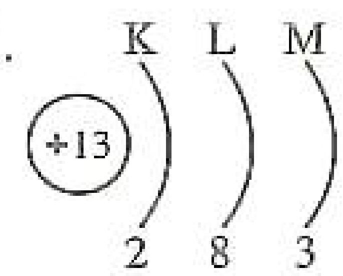
3. $Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$

(C) It is used in food preservation.

---

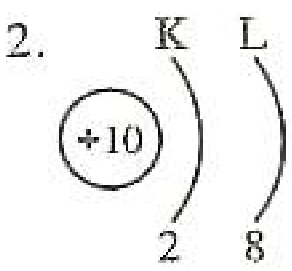
4 (A) 1. (✓) 2. (✗) 3. (✓) 4. (✗)

(B) 1.



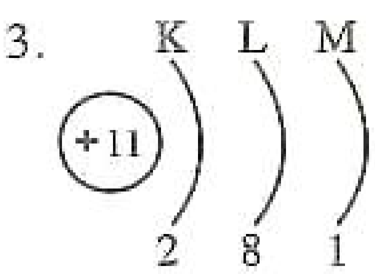
- Period (3)
- Group (3A)

2.



- Period (2)
- Group (0)

3.



- Period (3)
- Group (1A)

(C)

P.O.C.	Group (1A)	Group (7A)
Name :	Alkali metals group	Halogen group
Valency :	Monovalent elements	Monovalent elements

5 Mokattam Educational Zone

1 (A) 1. b 2. c 3. a 4. b

(B) 1. Argon. 2. Panda bear. 3. Infrared rays.

(C) Bohr.

---

2 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓)

(B) 1. atomic weights – atomic numbers.

2. thermosphere – mesosphere.

3. liquid – solid

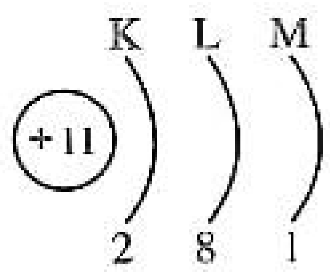
(C) Because in this part, the air motion is horizontally and neither clouds nor weather turbulences exist.

---

3 (A) 1. Cl_2 2. Methyl bromide gas 3. snow. 4. period

(B) 1. Desert. 2. Sodium. 3. Dobson.

(C)



- Period (3)
- Group (1A)

4 (A) 1. d 2. c 3. a 4. b

(B) 1. Aurora phenomenon.
2. Hydrogen bond.
3. Fossils.

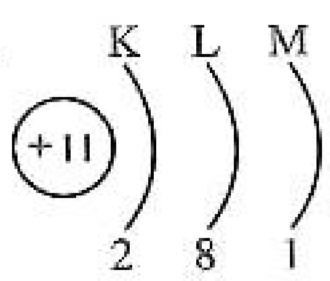
(C) – The decrease in temperature
= Height (km) × 6.5°C
= 2 × 6.5 = 13°C.

– The temperature at the top
= The temperature at sea level – the decrease in temperature
= 25 – 13 = 12°C.

6 Al Bayan Language School

1 (A) 1. CFC_S – halons
2. atomic weights – atomic numbers.
3. troposphere – exosphere
4. alkali metals – halogens.

(B) 1.



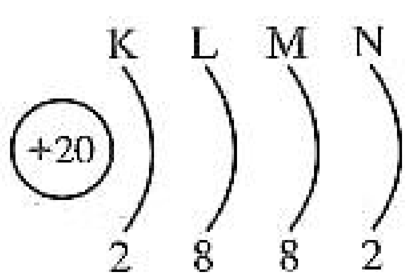
- Period (3)
- Group (1A)

2.



- Period (1)
- Group (0)

3.



- Period (4)
- Group (2A)

(C) Desert.

2 (A) 1. (✓)
2. (✗) The atomic size increases ....
3. (✗) .... in snow.
4. (✓)

(B) 1. b 2. b 3. a

(C) – The amount of decrease in temperature
= The height above sea level × 6.5
= 2 × 6.5 = 13°C.

– The temperature at the top of the mountain
= Temperature at its foot – the amount of decrease in temperature
= 25 – 13 = 12°C.

3 (A) 1. Ionosphere layer.
2. Global warming phenomenon.
3. Extinction. 4. Electronegativity.

(B) 1. Mesosphere 2. Mammoth
3. dobson.

(C) It is used in food preservation.

4 (A) 1. (1) Covalent bond. (2) Hydrogen bond.
2. 104.5°
3. - Covalent bond is strong.
- Hydrogen bond is responsible for abnormality properties of water.

(B) 1. Because their exhausts contain nitrogen oxides that cause erosion of the ozone layer.
2. Because it has the largest atomic size, so it can lose its valency electron easily.
3. Due to the presence of nummulites fossils in the limestone rocks of El-Mokattam mountain.

(C) $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

Giza Governorate

7 Dokki Educational Zone

1 (A) 1. a 2. a 3. b 4. c

(B) 1. Severe climatic changes.
2. Potassium.
3. Methyl bromide gas.

(C) ∵ Element (X) locates in :
- third period ∴ Its electrons are distributed in three energy levels.
- zero group ∴ The outermost energy level contains 8 electrons.

∴ The atomic number of element (X)
= 2 + 8 + 8 = 18

2 (A) 1. Ultraviolet – infrared
2. their atomic numbers – the way of filling their energy sublevels with electrons.
3. reptiles – birds. 4. half

(B) 1. Thermal 2. resinous matter.
3. bar or millibar.

(C) Because it preserved the bodies of dead animals from decomposition.

3 (A) 1. Polar compounds.
2. Natural protectorates.
3. s-block. 4. Ionosphere layer.

(B) 1. c 2. a 3. b

(C) $CO_2 + H_2O \longrightarrow H_2CO_3$

4 (A) 1. (✗) .... with inert gas.
2. (✗) .... stratosphere.
3. (✗) .... that causes the extinction of living organisms.
4. (✓)

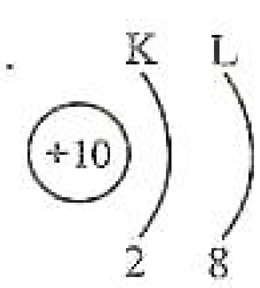
(B) 1. Trilobite. 2. Stratopause.
3. Ibis bird.

(C) – The amount of decrease in temperature
= height above sea level × 6.5
= 8 × 6.5 = 52°C.
– The temp. at the top of the mountain
= Temp. at its foot – The amount of decrease in temp.
= 30 – 52 = – 22°C.

8 Omrania Educational Zone

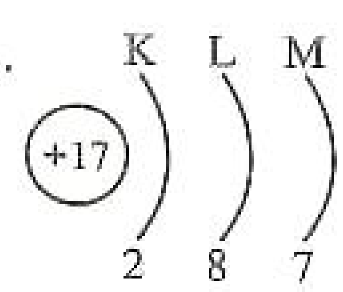
1 (A) 1. 1013.25 2. reptiles – birds.
3. methane gas. 4. 5

(B) 1.



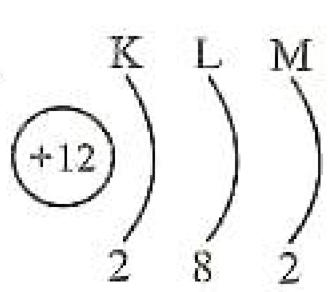
- Period (2)
- Group (0)
- p-block
- Type : Inert gas

2.



- Period (3)
- Group (7A)
- p-block
- Type : Halogen

3.



- Period (3)
- Group (2A)
- s-block
- Type : Metal

(C) $MgO + H_2O \longrightarrow Mg(OH)_2$

2 (A) 1. Hydrogen gas. 2. Aurora phenomenon.
3. Basic oxides. 4. Natural protectorates.

(B) 1. Chlorine. 2. Hofmann's voltameter.
3. Quagga.

(C) – The amount of change in temp.
= Temp. at its foot – Temp. at its top
= 25 – (–14) = 39°C.
– The height of the mountain
$= \frac{\text{The amount of change in temp.}}{6.5}$
$= \frac{39}{6.5} = 6$ km.

3 (A) 1. c 2. b 3. a 4. b

(B) 1. (✗) 2. (✗) 3. (✓)

(C) It is used in the preservation of cornea of the eye.

4 (A) 1. Bohr 2. Dobson.
3. fossils 4. blindness.

(B) 1. Due to the reduced size of its wings, so it is a non-flying bird.
2. Because in this part, the air motion is horizontally and neither clouds nor weather turbulances exist.
3. To prevent it from the reaction with moist air as it is an active metal.

(C) $Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$

9 6th of October Educational Zone

1 (A) 1. brain 2. 1013.25
3. Worms' tunnels 4. hydrogen

(B) 1. $_{10}Ne$ 2. Mesosphere
3. Cesium

(C) electrons that revolve in energy levels.

2 1. a 2. b 3. c 4. b

(B)

Odd word	Scientific term
1. Blindness	- Harms caused by biological pollution.
2. O_2	- Greenhouse gases.
3. O_2	- Alkali metals.

(C) Due to the reduced size of its wings, so it is a non-flying bird.

3 (A) 1. Metalloids. 2. Atmospheric envelope.
3. Extinction. 4. Electronegativity.
(B) 1. c 2. d 3. a
(C) It causes blindness.

4 (A) 1. an inert gas. 2. Thermosphere
3. Cast 4. increase
(B) 1. Water molecule.
2. Medium or far ultraviolet rays.
3. Shark's teeth.
(C) Snow – amber.

Alexandria Governorate

10 El-Agami Educational Zone

1 (A) 1. Metalloids. 2. Hydrogen bond.
3. Global warming phenomenon.
4. Fossils.
(B) 1. 17 – 18 2. oxygen – hydrogen
3. CFC_S – methyl bromide gas
(C) 1. alkali metals group. 2. larger

2 (A) 1. d 2. c 3. b 4. a
(B) 1. Na 2. O_2 3. Influenza.
(C) Because it has many alternatives.

3 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✗)
(B) 1. c 2. d 3. a
(C) $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

4 (A) 1. Moseley 2. far
3. Aneroid 4. Coral
(B) 1. Plastic reacts with chlorine gas (which is used as water disinfectant) leading to the increase in the infection rates by cancer.
2. Increasing the temperature of near-surface air of planet Earth.
3. It will change into amber that preserved the body of the insect buried inside it from decomposition.
(C) Ammonites – solid mold fossil.

11 Borg El-Arab Educational Zone

1 (A) 1. lose – positive ion.
2. thermosphere – mesosphere.
3. troposphere – exosphere
4. petroleum – sedimentary rocks.
(B) 1. a neutral 2. Non-metallic
3. Infrared
(C)

Simple ecosystem	Complicated ecosystem
- It is characterized by containing a few number of members of living organisms (few members).	- It is characterized by containing a large number of members of living organisms (multiple members).
- It is strongly affected by the absence of one of its species, because of the rarity of alternative that compensates this absence.	- It is not affected much by the absence of one of its species, because it has many alternatives.

2 (A) 1. Ionosphere layer. 2. Isobar.
3. Electronegativity.
4. Natural protectorates.
(B) 1. Boron. 2. Bald eagle. 3. Oxygen.
(C) Chlorine replaces bromine in its solution.
$Cl_2 + 2KBr \longrightarrow 2KCl + Br_2$

3 (A) 1. (✓) 2. (✗) 3. (✓) 4. (✗)
(B) 1. Mammoth fossil.
2. Methyl bromide gas.
3. Silicon.
(C) – The amount of decrease in temp.
= The height above sea level × 6.5
= 13 × 6.5 = 84.5 °C
– Temp. at the top of the mountain
= Temp. at its foot – the amount of decrease in temp.
= 24.5 – 84.5 = – 60 °C

4 (A) 1. d 2. d 3. c 4. a
(B) 1. Because they react with water forming alkaline solutions.
$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$
2. Because in this part, the air motion is horizontally and neither clouds nor weather turbulences exist.
3. Because sugar molecules can make hydrogen bonds with water molecules.
(C) 1. 17 2. 10

Qalyoubia Governorate

12 Banha Educational Zone

1 (A) 1. Atomic number. 2. Cesium.
3. Mesosphere layer. 4. Food chain.

(B) 1. Astatine. 2. Silicon. 3. Sugar.

(C) It is used to differentiate between acids and bases.

2 (A) 1. a 2. d 3. c 4. a

(B)

Odd word	Name of the rest
1. Blindness	Harms of biological water pollution.
2. $_5B^{+3}$	Their electronic configuration is similar to that of neon.
3. Water vapour	Pollutants of ozone layer.

(C) Trilobite – Cast fossil of fish – Crocodiles – Mammoth.

3 (A) 1. middle – d 2. anode – cathode. 3. 25
4. petroleum – sedimentary rocks.

(B) 1. (A) Sodium hydroxide.
(B) Hydrogen gas.
(C) Oxygen gas.
• The chemical formula of (A) is NaOH

2. By using a glowing splint, oxygen increases the glowing splint, while hydrogen burns with a pop sound.

(C) 1. • **Troposphere :** (– 60 °C) at its top.
• **Mesosphere :** (– 90 °C) at its top.

2. • **s-block :** Two groups (1A) and (2A).
• **p-block :** Six groups (3A) , (4A) , (5A) , (6A) , (7A) and (0)

4 (A) 1. (– 196 °C) 2. 315 : 400
3. Aneroid 4. Mammoth

(B) 1. Due to the higher electronegativity of oxygen compared with hydrogen.
2. Because it contains about 75% of the total mass of the atmospheric air.
3. Due to the rarity of alternative that compensates the absence of this species.

(C) The height at the middle of mountain

$$= \frac{\text{change in temp.}}{6.5} = \frac{24-(-2)}{6.5} = 4 \text{ km}$$

The height of the mountain = 4 × 2 = 8 km.

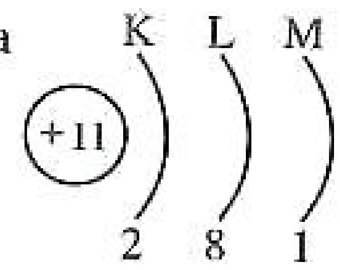
Sharkia Governorate

13 Science Inspectorate

1 (A) 1. b 2. b 3. a 4. b

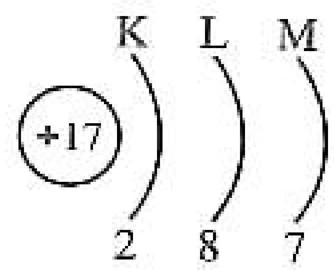
(B) 1. Sodium. 2. Skin cancer.
3. Oxygen.

(C) $_{11}Na$



- Period (3)
- Group (1A)

$_{17}Cl$



- Period (3)
- Group (7A)

2 (A) 1. (7A) – p
2. $Mg + 2HCl \xrightarrow{\text{dil.}} MgCl_2 + H_2\uparrow$
3. mesosphere – ionosphere.
4. Foraminifera – radiolaria

(B) 1. Mendeleev.
2. Dobson.
3. Rutherford.

(C) 1. A complete body fossil.
2. Petrified fossil.

3 (A) 1. Electronegativity.
2. Alkali metals group.
3. Global warming phenomenon.
4. Index fossils.

(B) 1. salts.
2. Silicon
3. stratosphere.

(C) ∵ The volume of hydrogen gas is twice the volume of oxygen gas.
∴ The volume of hydrogen gas = 40 cm^3.
The volume of oxygen gas = 20 cm^3.

4 (A) 1. b 2. e 3. a 4. d

(B) 1. (✗) 2. (✓) 3. (✗)

(C)

Cast	Trace
It is the replica of the external details of the structure of an old living organism leaving them in sedimentary rocks after death.	It is the traces that indicate an activity of an old living organism leaving them in sedimentary rocks during its life.

Menofia Governorate

14 Shebeen El-Koum Educational Zone

1 (A) 1. zero – p
2. atomic radius – picometre.
3. atmospheric pressure – temperature.
4. Ras Mohamed

(B) 1. (✗) 2. (✗) 3. (✓)

(C) 1. Rutherford. 2. Bohr.

2 (A) 1. b 2. d 3. c 4. a

(B) 1. Lead. 2. Ionosphere layer.
3. Hydrogen gas.

(C) Because the index fossils are the fossils of living organisms that lived for a short period of time in the past and had a wide geographic distribution, then became extinct and these conditions are not available in all fossils.

3 (A) 1. alkaline solutions. 2. two atoms.
3. 95 % 4. amber.

(B)

Odd word	Scientific name
1. Chlorine	Alkali metals group.
2. Helium	Metalloids.
3. Thermometer	Instruments of measuring the atmospheric pressure.

(C) Acidic oxide.

$$C + O_2 \xrightarrow{\Delta} CO_2$$

4 (A) 1. c 2. d 3. a 4. b

(B) 1. Because the difference in electronegativity between its elements is relatively high.
2. Due to the occurrence of greenhouse effect.
3. Because when it died, it was rapidly buried in snow which preserved it from decomposition.

(C) It is strongly affected due to the rarity of alternative that compensates this absence.

Gharbia Governorate

15 Science Inspectorate

1 (A) 1. 12 2. a salt of an acid
3. visible light 4. nummulites

(B) 1. Lithium 2. hydrogen 3. 1

(C) 1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$
2. By using a glowing splint, hydrogen gas burns with a pop sound.

2 (A) 1. Halogens. 2. Thermal pollution.
3. Ozone molecule.
4. Yellowstone protectorate.

(B)

Odd word	Scientific name
1. CO_2	Basic oxides.
2. k	Symbols of blocks of modern periodic table and also symbols of energy sublevels.
3. Methyl bromide	Greenhouse gases.

(C)

Mold	Trace
It is the replica of the internal details of the structure of an old living organism leaving them in the sedimentary rocks after death.	It is the traces that indicate an activity of an old living organism leaving them in sedimentary rocks during its life.

3 (A) 1. (✗) Sodium and ....
2. (✗) Carbonic acid ....
3. (✗) .... 13 kilometres.
4. (✓)

(B) 1. c 2. d 3. b

(C) It increases the infection rates by liver cancer.

4 (A) 1. a. • Period (2).
• Group (6A)
b. b
2. • The degree of erosion of ozone layer in an area = 300 – 225 = 75 dobson.

- The percentage of erosion of ozone layer in this area = $\frac{75}{300} \times 100 = 25\ \%$

3. a. The pine trees secreted resionous matter that changed after its solidification into amber.

   b. A complete body fossil.

4. a. Van-Allen belts.

   b. They surround the ionosphere layer.

(B) 1. Because it reacts with acids as a basic oxide and it reacts with bases as an acidic oxide giving salt and water in the two cases.

2. Because it contains a limited amount of hydrogen and helium gases only.

3. Because they indicate the age of sedimentary rocks, as the age of rocks is the same age of fossils existed in them.

(C) – The amount of change in temp.

$= \text{temp. at its foot} - \text{temp. at its top}$

$= 30 - (-6) = 36\ °C.$

– The height of the mountain

$= \frac{\text{The amount of change in temp.}}{6.5}$

$= \frac{36}{6.5} = 5.5\ \text{km}.$

Dakahlia Governorate

16 Science Inspectorate

1 (A) 1. c　2. c　3. b　4. a

(B) 1. transition elements – four.

2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2 \uparrow$

3. exosphere – mesosphere

(C) 1. p-block.

2. ∵ The atomic number of the element $= 2 + 6 = 8$ and it has 2 energy levels.

∴ The atomic number of the element that follows it in the same group $= 2 + 8 + 6 = 16$

2 (A) 1. (✗)　2. (✗)　3. (✓)　4. (✗)

(B)

Odd word	Scientific name
1. $_7N^{-3}$	Their electronic configuration is similar to that of argon.
2. Hydrogen.	Halogens.
3. Contains (99%) of water vapour.	Properties of stratosphere layer.

(C) 1. They indicate the environment where they lived was clear warm shallow seas.

2. They are found in the limestone rocks of El-Mokattam mountain and they indicate that this area was a sea floor.

3 (A) 1. p-block elements.　2. Hydrogen bonds.　3. Altimeter.　4. Wadi El-Hetan.

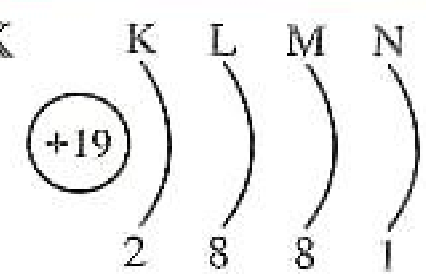
(B) 1. b　2. e　3. a

(C) 1. (M) Potassium chloride.

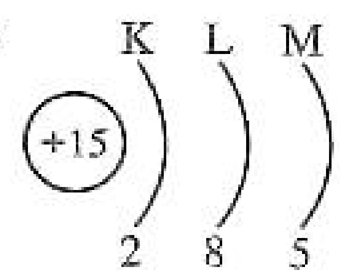
(B) Potassium hydroxide.

2. - Gas (X) is hydrogen gas.
   - By using a glowing splint, hydrogen gas burns with a pop sound.

4 (A) 1. - $_{19}K$



- $_{15}P$



2. - **Troposphere :** Temperature at its top is (– 60 °C).
   - **Mesosphere :** Temperature at its top is (– 90 °C).

3. - **Ozone :** It consists of three atoms.
   - **Oxygen :** It consists of two atoms.

4. - **Quagga** is from extinct species.
   - **Bald eagle** is from endangered species.

(B) 1. The acidified water decomposes into hydrogen gas evolves at the cathode and oxygen gas evolves at the anode. The ratio between the produced hydrogen gas and oxygen gas is about (2 : 1) by volume respectively.

$$2H_2O \xrightarrow{\text{Electrolysis}} 2H_2 \uparrow + O_2 \uparrow$$

2. Increasing the temperature of near-surface air of planet Earth.

3. The number of locusts increases and eat all green plant leading to disturbance of the ecosystem equilibrium.

(C) 1. Dinosaur's tooth.　2. Archaeopteryx.

Ismailia Governorate

17 Science Inspectorate

1 (A) 1. four – 10
2. food preservation – preservation of cornea of the eye.
3. chemical – thermal
4. reptiles – birds.

(B) 1. Lead. 2. MgO 3. CO_2

(C) not illuminate – a bad conductor of electricity.

2 (A) 1. Metalloids. 2. Negative ion.
3. Ionosphere layer. 4. Extinction.

(B) 1. b 2. c 3. a

(C) **Figure (1)** is panda bear and it is from endangered species.
Figure (2) is dodo bird and it is from extinct species.

3 (A) 1. b 2. a 3. d 4. b

(B) 1. hydrogen 2. an inert gas.
3. bar or millibar.

(C) – The amount of decrease in temp.
= The height above sea level × 6.5
= 2 × 6.5 = 13 °C.
– The temp. at the top of the mountain
= Temp. at its foot – the amount of decrease in temp. = 20 – 13 = 7 °C.

4 (A)

Odd word	Scientific name
1. Helium	Alkali metals group.
2. Oxygen	Pollutants of ozone layer.
3. Thermometer	Instruments of measuring the atmospheric pressure.
4. Cast of fish	Petrified fossils.

(B) 1. • **Alkali metals :** s-block.
• **Halogens :** p-block.
2. • **Troposphere :** The temperature at its top is (– 60 °C).
• **Stratosphere :** The temperature at its top is (0 °C).

3.

Coral fossils	Ferns fossils
They indicate that the environment where they lived was clear warm shallow seas.	They indicate that the environment where they lived was a hot and rainy tropical environment.

(C) 1. die
2. increase – the ecosystem equilibrium.

Port Said Governorate

18 Port Said Educational Zone

(A) 1. b 2. a 3. d 4. b
5. d 6. b 7. c 8. d
9. c 10. d 11. b 12. b
13. b 14. c 15. b 16. b
17. d 18. d 19. d 20. a
21. b 22. a 23. c 24. b
25. d

(B) 26. It reacts with oxygen forming nonmetal oxide (carbon dioxide).

$C + O_2 \xrightarrow{\Delta} CO_2$

27. Nitrogen oxides. 28. MgO
29. Metalloids.
30 The pilots cannot measure the elevation of navigation.
31. hydrogen – covalent
32. They play an important role in scattering harmful charged cosmic radiations away from the Earth.
33. 17
34. Because it contains a limited amount of helium and hydrogen gases only.
35. To prevent their reaction with moist air as they are active elements.

Minia Governorate

19 Deir Mawas Educational Zone

1 (A) 1. Fossils. 2. Ozone hole.
3. Mendeleev's periodic table.
4. Biological pollution.

(B) 1. Van-Allen. 2. Bohr.
3. Moseley.

(C) 1. Bromine. 2. MgO

2 (A) 1. single covalent 2. exosphere
3. Dodo bird 4. four

(B) 1. c 2. a 3. b

(C) 1. Mammoth.
2. It is from extinct species.

3 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✗)

(B) 1. Argon 2. Troposphere.
3. Noisy pollution.

(C) 1. $Cl_2 + 2NaBr \longrightarrow 2NaCl + Br_2$
2. $CO_2 + H_2O \longrightarrow H_2CO_3$

4 (A) 1. birds. 2. Aneroid
3. CFC_S 4. (1A)

(B) 1. Because the difference in electronegativity between the elements forming their molecules is relatively high.
2. Because it contains most of ozone gas (O_3) which is found in atmospheric envelope.
3. Because they give us the details about the life of an old plant.

(C)

Simple ecosystem	Complicated ecosystem
Desert.	Tropical forest.

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1 (A) 1. b 2. a 3. b 4. c

(B) 1. They play an important role in scattering harmful charged cosmic radiations away from the Earth.
2. It is used in preservation of cornea of the eye.
3. Silicon slides are used in the manufacture of electronic devices such as computer.

(C) – Height in km = 2000 ÷ 1000 = 2 km.
– The amount of decrease in temp. = The height above sea level × 6.5
= 2 × 6.5 = 13 °C.
– The temp. at this height
= temp. at the sea level – the amount of decrease in temp.
= 33 – 13 = 20 °C.

2 (A) 1. fish. 2. Rutherford.
3. Cesium 4. volume

(B)

Odd word	Scientific term
1. Halons	Greenhouse gases.
2. Fossil record	Types of fossils.
3. Quagga	Endangered species.

(C) 1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2 \uparrow$
2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2 \uparrow$

3 (A) 1. Index fossils. 2. Electronegativity.
3. Radioactive cobalt 60
4. Liquid sodium.

(B) 1. Bromine. 2. Worms' tunnels.
3. Papyrus plant.

(C)

Simple ecosystem	Complicated ecosystem
It is strongly affected by the absence of one of its species, because of the rarity of alternative that compensates this absence. Ex. : Desert.	It is not affected much by the absence of one of its species, because it has many alternatives. Ex. : Tropical forest.

4 (A) 1. mercury – lead
2. troposphere layer – mesosphere layer.
3. age – evolution
4. ionic compounds – covalent compounds.

(B) 1. (✗) 2. (✗) 3. (✓)

(C) 1. Because they contain petrified woods which look like rocks.
2. Because in this part, the air motion is horizontally and neither clouds nor weather turbulences exist.